





THE
YOUNG STETHOSCOPIST;

OR,

THE STUDENT'S AID

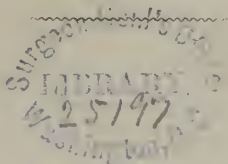
TO

AUSCULTATION.

BY HENRY I. BOWDITCH, M.D.,

One of the Physicians of Mass. Genl. Hospital.

SECOND EDITION.



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TO

JAMES JACKSON, M.D.,

WHOM, IN THE EARLIEST HOURS OF MY MEDICAL LIFE, IT
WAS MY GOOD FORTUNE TO CALL

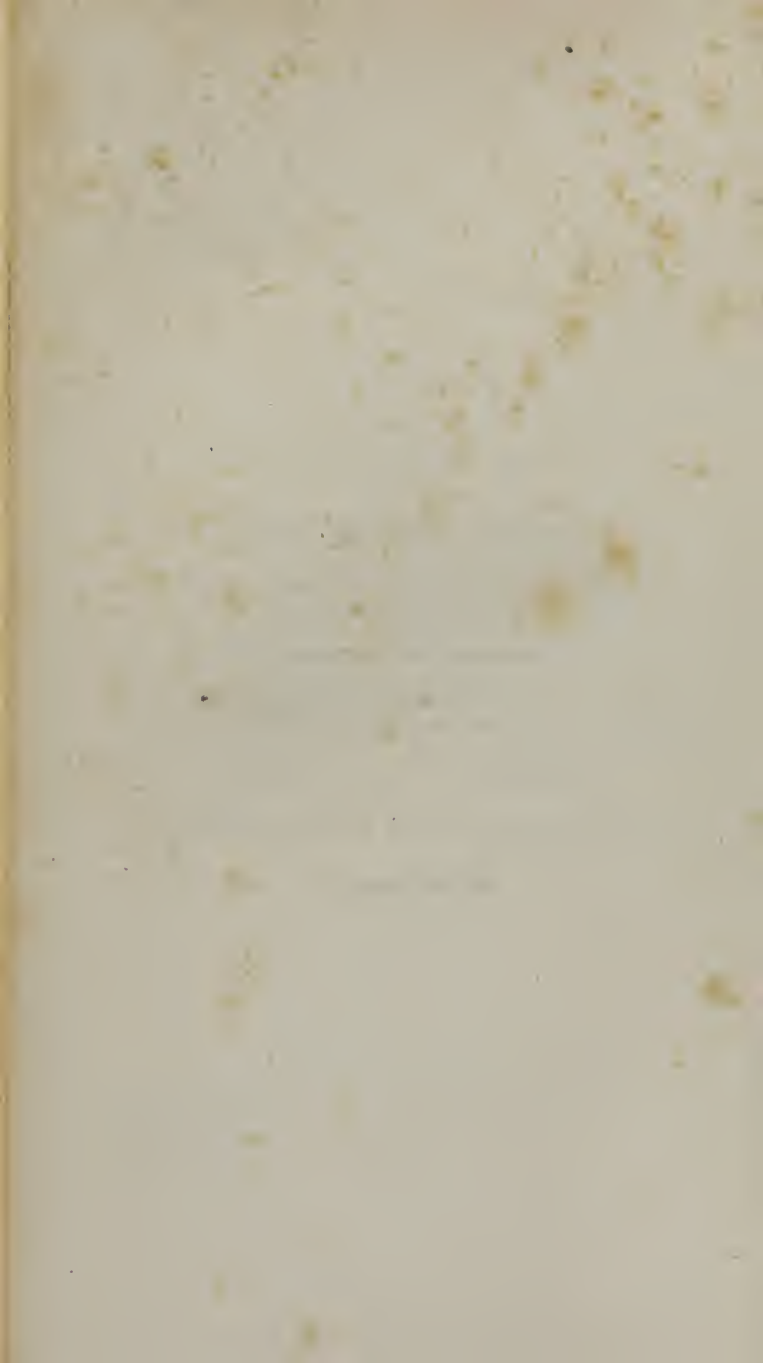
FATHER IN MEDICINE,

AND TO WHOM, DURING THE YEARS OF MY PROFESSIONAL PRACTICE,
IT HAS BEEN MY HAPPINESS TO LOOK AS

COUNSELLOR AND FRIEND,

THIS LITTLE WORK IS GRATEFULLY

Dedicated.



TO THE
STUDENT OF AUSCULTATION.

FOR you have I prepared this book on physical diagnosis. In its preparation I have endeavored to be concise, yet clear and comprehensive. Its name indicates its object ; viz. to give you, in a compact form, a complete view of what are technically called the physical signs. But I have had another, and perhaps equally important end in view, viz. to make you feel that the *time*, the *place*, the *circumstances* in which you may meet with these morbid signs, and the relations which they bear to the rational signs, are of as much importance as the physical signs themselves. There have been, I think, too many minute distinctions in regard to the particular sounds, a diffuseness of detail that has served to discourage you rather than to allure you onward in the study of the interesting art of auscultation.

But this book is not intended to supersede many others of a more elaborate character. I have prepared it as a pocket companion merely ; a kind of summary of the essentials of auscultation, the details of which you will find more fully displayed in other and larger works. Among these last, there are many to which I am indebted. The immortal labors of Laennec are the fountains whence have flowed all subsequent writings on the subject. To the numberless host of his followers, I have endeavored to give due credit, whenever I have borrowed any ideas from them. Nevertheless, the greater part of the book, at least so far as it relates to the thorax, is a transcript of my own mind, as it has formed its opinions during the experience of several years' practice. To Hope, Bouillaud, and Pennock I owe much on diseases of the heart ; to Fisher, Whitney, and Smith is due almost all I have given on cephalic auscultation ; from Drs. Cammann and Clark's publications has arisen the article on auscultatory percussion ; on obstetric auscultation, I have consulted freely the invaluable work of Dr. Kennedy ; and from the writings of Youatt and Percival, I have drawn my accounts, meagre though they may be, of veterinary auscultation. I cannot forbear stating in this connexion how much I owe on this subject to my

former preceptor and kind friend, Louis. It was in his wards, at La Pitié, that I first caught a love for physical and rational diagnosis, as a means of cultivating the higher faculties of the mind, which I trust I shall ever carry with me.

In conclusion, while presenting this little work on the physical signs, let me disclaim all intention of placing them higher than they really deserve. Fifteen years ago, they were sneered at by many persons. Now, very few would be foolish enough to do so, and the tendency is strong to overrate them. Amidst the niceties of our physical examinations we are apt to neglect the rational signs. The truth is, that he who scoffs at either must necessarily be a child in the diagnosis of not a few diseases; and he who cultivates both with the clear, keen-sighted eye of a true observer, and then notes their mutual relations, is the truly wise physician. Both categories of signs are useful, each in its own sphere; and neither should be allowed to predominate; neither should be neglected.

H. I. B.

BOSTON, 1846.



P R E F A C E

TO THE SECOND EDITION.



I FEEL grateful for the kind reception that the YOUNG STETHOSCOPIST has met with from the Medical Profession of America. I have made some additions to the original Work, in order to bring it up to the present state of knowledge ; and I have corrected some inaccuracies that accidentally crept into the former edition. My thanks are due to Drs. Fisher and Putnam, and Mr. Francis S. Williams, of this city, for the assistance which they have cheerfully given me during the preparation of this edition.

In writing my remarks "to the Students of Auscultation," as a Preface to the First Edition, I hoped to forestall all criticism that would impute to me a desire to claim anything for myself, more than I really deserved. In those remarks, and elsewhere, I endeavored to give an ample, though general acknowledgment, of the aid which I had received. I have, however, been misunderstood, and

have been accused by a writer in a Review, which I have always most highly respected, of appropriating, "with imposing coolness," the works of others. Conscious as I am of never having intentionally injured a professional associate, I submit, without fear, and without retaliation, to what I conceive to be an unjust criticism. I allude to it now, chiefly, for the purpose of preventing any remarks of a similar character at any future time. My own knowledge had its origin in the well known writings of others, to which, as bound in honor, I made general reference. This knowledge had been applied during several years of practice, and the work was "a transcript of my mind," developed under their influences. It claims nothing for itself as original, except the adaptation of the information, so obtained, to the purposes for which it was intended; although, on a few points, I believe I have presented some new views on the subject of Auscultation.

H. I. B.

Boston, Feb. 5, 1848.

THE

YOUNG STETHOSCOPIST.

PRELIMINARIES ABSOLUTELY ESSENTIAL TO AN ACCURATE EXAMINATION OF THE PHYSICAL SIGNS OF DISEASES OF THE CHEST; WITHOUT STRICT ATTENTION TO WHICH, NO ONE CAN BECOME AN ACCURATE AUSCULTATOR.



THE patient should have the chest wholly uncovered, or clothed only with a thin, single dress. If possible, he should sit or stand; but if this be impracticable, let him lie *perfectly flat* on his back: inasmuch as a pillow, supporting one shoulder and not the other, may change the character of the sound produced by percussion, and also of the respiratory murmur. If you cannot observe these rules, you must then be cautious of your inferences, however accurately in other respects you may appear to make your examinations.

The *time* at which the examination should be made

often becomes as important as the manner in which it is conducted. For example: I have frequently observed that very slight physical signs can be discovered about midday, when the patient may be less disposed to cough than at other times. On the contrary: if the examination be made at the hour at which the individual has a greater inclination to cough, whether that be before the patient rises, or soon after he has retired to bed, very marked phenomena appear. Within the past few years this rule has been to me of inestimable importance, and therefore I recommend it to you.

1. The following Plates show the best positions for examining the front, back, and sides of the chest.

Fig. 1.

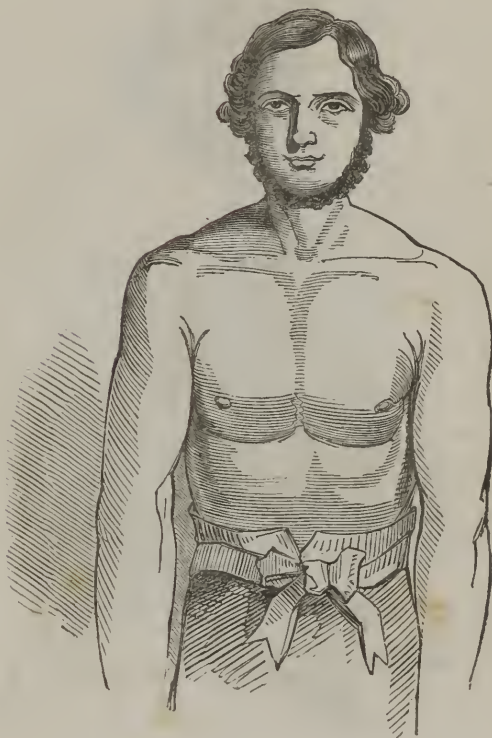


Fig. 2.

Fig. 3.

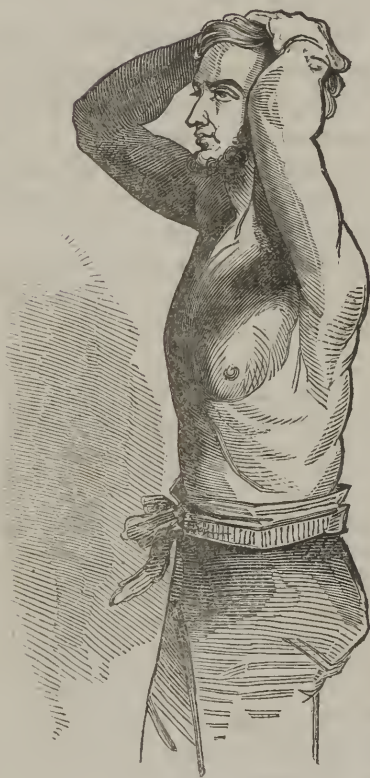


Fig. 1. This position is the best for the front and the tops of the shoulders. Let the arms fall easily by the sides of the body, and let the body be erect and firmly poised.

Fig. 2. In this position (which is that to be assumed when the back is to be examined), the scapulæ are drawn forward, making the whole back tense, and more resonant than in figure 1. Let the arms be clasped firmly in front, and the head and neck bent forward, so that a regular curve is formed by the dorsal and cervical vertebræ.

Fig. 3. This position is rarely needed, except in the examination of the axillæ. Let the palms of the hands rest lightly on the vertex.

2. In the acts of auscultation and percussion, always compare one lung with the other, and one part of the lung with the corresponding part of the other.

3. The above is a most important rule; and, in order to follow it accurately, I measure with my eye equal distances laterally from the median lines of the sternum, and of the spinous processes of the vertebræ; and vertically from the clavicles, the tops of the shoulders, the spines of the scapulæ, &c.

4. EXAMPLES. Strike upon the sternal end of one clavicle and on the acromial end of the other, and observe the difference. Again; try the difference between the sound on percussion over the lower angle of one scapula, and that heard on a spot an

inch or two below the corresponding angle of the other scapula. Similar examples might be cited with reference to the respiration and the voice.

5. This rule is especially necessary in cases where there is only *a difference of note, or pitch* (99), and no real dullness on percussion, a circumstance which occurs not unfrequently in the earlier stages of phthisis.

INSPECTION.

INSPECTION, as a method of examination, is of some moment ; but far less reliance is to be placed upon it than upon any of the other methods of examination. The two sides of the chest are rarely symmetrical, even in the most healthy persons : the right, according to some writers, being larger than the left by half an inch. The pulsation of the heart not uncommonly causes a slight prominence over the præcordial region. The slightest lateral curvature of the spine will make one side more prominent, and one shoulder higher than the other. This last cause of want of symmetry is almost universal, and is perceptible at a glance. To examine *thoroughly*, by inspection, the chest must be naked.

7. Diseases cause great changes in the results of inspection.

8. **EXAMPLES OF DILATATION.** An old man, long affected with asthma, usually has more or less general emphysema, or dilatation of the air-vesicles. In such cases we *commonly* find the chest more rounded than usual ; the intercostal spaces even with the ribs, or perhaps projecting beyond them ; the clavicles scarcely to be seen, owing to the prominence of the adjacent soft parts (175). These appearances are

usually more manifest over one lung than the other. Acute pleuritic (137) and pericardial (262) effusions cause dilatations. The former may enlarge the whole of one side of the chest; the latter, of course, is limited to the left breast. Malignant tumors, causing enlargement of the thorax, are very rare. Aneurism of the aorta may press out through the sternum, or behind between the vertebræ and scapulæ (342, *Fig. 38*).

9. **EXAMPLES OF CONTRACTION.** An old pleurisy with thick membranes will contract a whole side, so that the shoulder will fall, the scapula become more prominent and lower, and the intercostal spaces concave (142, *Fig. 28*). Phthisis, with partial pleurisy covering the apex of either lung, causes contraction about the clavicle, thereby rendering it more prominent than usual (144).

10. **TO OBSERVE THE MOTIONS** of the chest is very necessary, especially in children. Great motion of the muscles of the neck, or abdomen, either with or without increased motion of the respiratory muscles, is always a serious symptom. It occurs in severe, acute inflammations of the larynx, bronchi, or substance of the lung, in severe attacks of asthma (182) and in pneumothorax (163). A labored breath is observed in acute phthisis. Absence of motion of the chest is observed on the diseased side in pneumothorax (163), or pleuritic effusion (139); and particular regions in chronic phthisis (162). A permanently distended condition of the thoracic parietes, with very

little motion, but with forcible compression of the intercostal spaces in expiration, is sometimes seen in emphysema (176). A pulsation, perceptible in a part, may indicate enlarged heart (275), or aneurism (335), &c.

11. **EXAMPLES.** In the laryngitis of adults, and croup of children, the most violent motions of the cervical respiratory muscles are observed. These motions serve to open, as far as possible, the passage which is gradually closing. A severe pneumonia, or a pleuritic effusion, or pneumothorax, of one side, may cause active movement of the muscles of the other, because one lung being put out of use, the other is obliged to labor harder in order to perform the respiratory function. Sometimes the abdominal muscles alone perform the respiratory movements. This is usually a serious symptom, for it may indicate that there is severe acute disease on both sides of the thorax. The labored breath of acute phthisis is owing to the sudden development of miliary granulations throughout both lungs, and is marked by frequent motion of the chest, panting, rather than by any very distressed movements, such as are observed in pneumothorax, double pneumonia, &c.

12. A pulsation and a lifting-up of the parietes of the left breast is very common in hypertrophy of the heart (275). Aneurism of the aorta generally shows itself by slight pulsations at the upper part of the sternum (335). It is rare to find the same amount of motion when the disease protrudes behind.

13. EXAMPLES OF DIMINISHED MOTION. Chronic phthisis, by the adhesions consequent thereupon, may cause a diminution of motion of the upper ribs of the diseased side. Pneumothorax (163), and great pleuritic effusion (139), of course, cause the same effect throughout the whole of a diseased side. Effusion into the pericardium renders the usual impulse of the heart imperceptible (261, *a*).

PALPATION.

PALPATION of the chest is the application of the hand or finger to the parietes, for the purpose of recognising the health or disease of the thoracic viscera. A slight tremor may at any time be felt by applying one's hand to the chest of a person in health while he is speaking or coughing. This is modified by disease. It is augmented by the hepatization of pneumonia (123), by a tuberculous cavity communicating with the bronchi (160); it is diminished, or wholly absent, by pleurisy (139), with effusion of fluid, and by tumors may produce similar results. The sonorous (62) and crackling (68) râles and the rubbing sounds (77) are sometimes felt by the physician, and very frequently by the patient. A peculiar thrill, called *fremissement cataire* (206) by the French, similar to that perceived on placing the ends of the fingers upon the chest of a cat when she is purring, is felt at times over aneurisms, and in some affections of the heart, that cause obstruction to the passage of the blood. The impulse of the heart is likewise perceived by the hand, but more distinctly by the ear and head, and still more evidently by the ear, armed with a stethoscope (240). The strength of this im-

pulse varies in different diseases. Fluctuation may very rarely be felt in the case of a fluid in the cavity of the pleura.

15. N. B. This method of exploration is of so little importance, it conveys so little real knowledge, except, perhaps, with reference to the operation of paracentesis thoracis, that very little use is made of it. The thrill of the voice, the râles, the rubbing sound, the *purring* sensation, &c., are usually more distinctly recognised by the ends of the fingers, than by the whole hand, however carefully the latter may be placed upon the part.

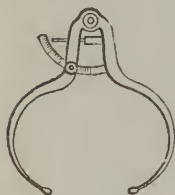
SUCCUSSION.

THIS method of examining the chest consists in suddenly shaking the patient in order to determine whether air ~~or~~ fluid exist in the pleural cavity. Since the time of Hippocrates it has been used; but it is very unsatisfactory in its results, and likewise is troublesome to the patient. Therefore, since Laennec has proved that other and better signs of pneumo-hydrothorax exist, succussion has been almost wholly abandoned. If you wish to try it, do as follows. Let a man be seated, and then seizing him by both shoulders, shake suddenly and somewhat forcibly the whole trunk. If air and fluid are in the pleural sac, you *may* hear a sound like that produced by shaking a bottle containing a little fluid (168).

MENSURATION.

MENSURATION, as the name denotes, is merely the admeasurement of the different parts of the chest, but it usually does not add much to what the eye readily perceives, which often detects of itself what admeasurements never would have done. It is used in pleurisy with effusion (137), hydrothorax, emphysema (175), phthisis (160), disease of the heart (207), pneumothorax (163), &c. The dimensions of one side of the thorax may be compared with the other, by means of a tape passed around the chest at different distances from the apex of the lungs.

Fig. 4.



We must notice the position of the nipples in reference to the middle of the sternum, the clavicles, and the spinous processes of the ilia. The position of the scapulæ with regard to the vertebræ and ilia, and the thickness of the two lungs from front to back should be observed. Some use callipers (*fig. 4*) for these pur-

poses.

17. **EXAMPLES.** Hydrothorax, and pleurisy with effusion of fluid, enlarge the diseased side sometimes more than an inch. Frequently, however, inspection

discovers a "great difference, when the tape does not give so much real enlargement. In this same case, the nipple of the diseased side is raised towards the clavicle and thrown out from the sternum; whereas, in chronic pleurisy, with contraction of the side, exactly the reverse takes place (137). The scapula, in chronic pleurisy, falls towards the vertebræ (138). The contraction over the apex of a tuberculous lung may be recognised by the instrument. Inspection does the same, perhaps, nearly as well (144-5). One late French writer proposes a spring made of steel, to measure the arc of the circle formed by the prominence from a diseased heart (262).

AUSCULTATION.



AUSCULTATION may be *mediate* or *immediate*. It is called *mediate* when we make use of a stethoscope; and *immediate* when the ear is applied directly to the chest. Laennec thought the whole art rested on the stethoscope. All tyros in auscultation discuss the relative merits of the numerous stethoscopes. Adepta do not discard the instrument, for in some cases they find it useful, but in the vast majority of instances of disease the ear is sufficient. I find a stethoscope needed in most diseases of the heart, when I am desirous of making an accurate diagnosis; in obstetric auscultation, and in deciding the relative condition of two small spaces of one or both lungs. All I seek in a stethoscope is lightness, smallness, and a good-sized ear-piece.

19. The following figures give an idea of some of the common forms of the instrument. *Fig. 5* is copied from a stethoscope in my possession originally owned and used by Laennec. It is divided into two

Fig. 5. parts united by a screw (*fig. 6*), for the purpose of shortening it if necessary, and has a plug at its lower extremity. This last was thought necessary for the examination of the heart and of the sound of the voice. The instrument is wholly obsolete, being altogether too heavy and unwieldy.



20. *Figs. 7, 8, 9, & 10*, contain Piorry's stethoscope.

Fig. 7. *Fig. 7* shows it prepared for auscultation. *Figs. 8 & 9* represent its various parts separated; *fig. 8* being the shaft of the instrument; *fig. 9, a*, being an ivory ear-piece, pierced with a screw to fasten it to the upper part of the shaft; *b*, a plessimeter (see plessimeters) which can be screwed to the bottom of the same; *c*, the plug to be used as in Laennec's instrument. *Fig. 10* represents it in a portable form, the ear-piece being screwed upon the bottom of the plessimeter. This is a convenient form, but the ivory edge at the bottom of the shaft is apt to hurt the person who is ausculted. The plug likewise is found to be unnecessary.



20 *a.* One of the best instruments for conducting delicate shades of sound, is that proposed by Dr. C. J. B. Williams of London.

Fig. 11 represents the instrument prepared for use.

Fig. 11. It is made of soft sycamore wood. *Fig. 12.*



It is hollow ; has thin parietes, and a trumpet-shaped mouth. *a* is a movable ear-piece, which can be introduced into the other end of the tube, as represented in *fig. 12*, to make the instrument more portable and less



liable to receive injury in the pocket ; or it *a* may be placed on the chest, while the ear may be applied to the trumpet-mouth of the instrument, when we wish to examine the voice. To do this the stethoscope should be arranged as in *fig. 11*.

21. *Figs. 13, 14, & 15* present a very convenient *Fig. 13.* form proposed by Dr. Bigelow, of this *Fig. 15.*



Fig. 13 shows the instrument. It is wholly of soft wood. The ear-piece is broad, so that its side may be pressed on the chest and used as a plessimeter. *Fig. 14* is a worsted ball, covered with velvet, through which a slender but firm handle of ebony passes.



Fig. 14.



This is used as a precursor, instead of the tip of the finger, in order to avoid the click of the nails, which sometimes causes a confusion of sounds. *Fig. 15* represents the instrument in its portable condition. This stethoscope is very convenient for auscultation. As an instrument for percussion, I use

it, at times, behind the clavicle, but even there I prefer a piece of caoutchouc, or my fore-finger.

22. *Fig. 16* is the flexible stethoscope used by Dr. Pennock, of Philadelphia, for the sounds of the heart.

Fig. 16. It is an elegant instrument, about two feet long. I have not used it much; but if Dr. Hope's rule is of importance, viz. that, while auscultating the heart, we ought to have one hand upon the pulse, it would evidently be impossible to use it, for it requires the use of both hands of the auscultator. A similar one is used by Dr.

Golding Bird, of London.

Fig. 17. 23. *Figs. 17 & 18.* These plates are intended to represent the solid stethoscopes used by Drs. Cammann and Clark, in Auscultatory Percussion (386). They are made of soft wood. *Fig. 17* is a cylinder, about six inches by three-quarters of an inch; the other (*fig.*

Fig. 18. 18) is like a cylinder of the same dimensions, made wedge-like, in order that the narrow part may be placed on the soft parts between the ribs.



AUSCULTATION OF THE RESPIRATION.



RESPIRATORY MURMUR. This is a very delicate, breezy sound, which is heard on application of the ear to the chest; chiefly during inspiration; very little in expiration.

25. This sound is influenced by age: being loud in childhood, hence called *puerile*; and more indistinct in adult and old age;

26. By position: as when a constrained posture, causing contraction of the muscles of the chest, prevents a full expansion of the lungs, and diminishes the sound;

27. By temperament: it being often scarcely heard in a full-sized, healthy man, while it is very distinct in one who breathes more quickly, and is of a more active temperament;

28. By diseases: when one lung diseased may cause puerile murmur in the other; as, for example, in pneumonia, pleurisy, pneumothorax, tumors, &c., that prevent one lung from acting, but stimulate the other to the puerile respiration. So, likewise, if one part of a lung is filled with tubercles, or is otherwise obstructed, puerile respiration may at times be heard

in those parts that are healthy. Any cause, in fact, which puts suddenly out of use a large part of either lung, will diminish or destroy the sound in one part, and generally increase it in another. Emphysema diminishes it (178); pleurisy may destroy it (132).

29. The respiratory murmur varies in different parts of the thorax. It is generally stronger at the lower portions than above, and frequently very distinct throughout the whole of the back, when it is heard with difficulty in front; and *vice versâ*; yet the person may be healthy, and there will be no sufficient explanation of the fact. In such cases we must remember to compare, with great accuracy, parts equidistant from the median line, keeping in mind the natural differences that exist between two lungs (2, 38).

30. This murmur is influenced by emotions of the mind: as, if a child be frightened and cry, all sound for a time is prevented. In some nervous females, it is at times impossible to hear any sound;

31. By rapidity of breathing: the respiratory murmur becoming louder with increase of frequency;

32. By the action of the heart: agitation of the mind or organic disease, rendering the sounds of the heart so loud as to obscure the respiratory murmur. You will meet with the former source of difficulty not unfrequently when ausculting a nervous person for the first time.

33. This murmur is altered by any injury whereby

the muscles of the chest are prevented from acting freely : as in the case of a man whose arm had been torn off at the shoulder joint, and the cicatrix had contracted so much that the corresponding side of the thorax could not dilate ; and a diminution of the sound of respiration was the consequence. .

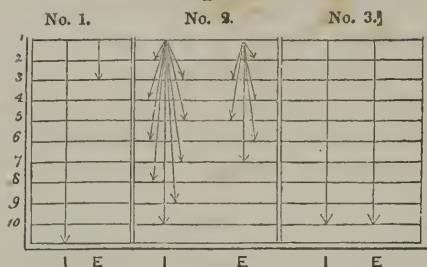
34. Though the expiration is usually slight, except as described (38), it is equally important with inspiration as a means of diagnosis.

35. The ratio of the length of inspiration to that of expiration should be carefully studied, it being commonly in the healthy lung as ten to two (46).

36. Any disease that condenses the lung causes a change in this ratio ; for example, pneumonia or tubercles, with condensation of the lungs. The inspiratory murmur is usually first changed and rather diminished in length, while the expiration is soon prolonged. When perfect hepatization from pneumonia occurs, the sounds are frequently of the same length and of the same character (41, 46, 122). In cases of dilated bronchi, and over cavities in the lung, we frequently find the expiration prolonged.

36 *a*. The following diagram shows, in a general manner, the relative differences that appear in the inspiration and expiration in health and disease. The diagram is divided into three compartments, by three vertical lines, marked by 1, 2, 3, and each of these into ten smaller divisions, by lines at right

Fig. 19.



angles to the latter, marked by 1, 2, 3, &c., to 10. Compartment No 1 shows the natural vesicular respiration, in the healthy lung, in which the inspiration is to the expiration as ten to two. Compartment No. 2 shows some slight solidification of the lung, from tubercles, pneumonia, &c. The arrow-points, resting on all the various lines, indicate the various changes that occur in either part of the respiratory act. No *definite* decision can be formed from these changes, but of course the more the vesicles become obstructed, the less will the inspiratory sound be heard, until the tubular becomes manifest. Compartment No. 3 indicates complete solidification from pneumonia, or from a cavity, in both of which the two acts are nearly identical in length and in their *tubular* character.

36 *b*. Too much stress should not be laid upon the difference between the lengths of the healthy inspiration and expiration; for although the above rule is undoubtedly generally true, you must not infer that disease exists, if the ratio is changed *throughout*

both lungs. In such a case, I should decide that very probably the peculiarity is the result of original conformation of the bronchial tubes.

36 c. The annexed figures will be occasionally referred to, and are therefore introduced here.

Fig. 20.

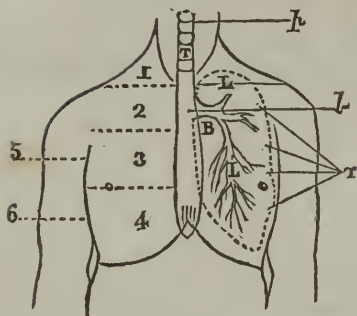
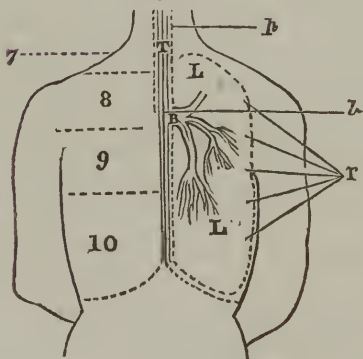


Fig. 21.



The figures 1, 2, &c., to 10, mark arbitrary divisions of the thorax.

1. Post clavicular space.
2. From clavicle to 2d rib.
3. " 2d rib to 4th "
4. " 4th " to base of breast.

5 & 6 divide the sides into two equal parts below axilla.

7. Top of shoulder.

8. From top to spine of scapula.

9. From spine of scapula to lower angle of do.

10. From lower angle of do. to bottom of back of chest.

..... Projection of the outlines of the lung L.

T. Trachea, over which is heard in health, tracheal or cavernous respiration with pectoriloquy.

B. Large bronchial tubes, over which are heard in health, bronchial respiration and bronchophony.

r r. Points upon the superficies of the lung, and remote from B ; vesicular respiration is heard there, with the natural, slight resonance of the voice.

37. REMARKS. Nos. 1, 2, & 7, are very important, in cases of suspected phthisis ; 3 & 4 on the *left* side, in suspected disease of pericardium and heart ; 9 & 10, in cases of pleurisy, and generally of pneumonia (143, 117, 128, 258).

38. There is naturally a *prolonged* expiration in some persons, at the top of the right lung in 1 & 2, in front, and in corresponding parts behind, owing to

the fact that the right primary bronchus is larger and shorter than the left. The adjacent

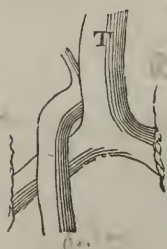


figure shows the reason for this increased length of the left primary bronchus. The aorta crosses it just as the arch turns, and consequently the lung is put further off. The plate represents the posterior view of the various parts. But when a *prolonged* expiration is heard elsewhere, it is always morbid, and is an important indication of disease.

39. A *natural bronchial* or *tubular* sound of respiration is usually found in health at the *union* of the regions marked 2 in front and 8 behind. The air seems passing through a more or less distant tube.

40. N. B. Study this sound thoroughly on children and thin adults, upon whom it can be heard more distinctly than on others. In some stout, or very fat people, it will be difficult for you to recognise it, but by observing its varieties in healthy persons, you will be better prepared to recognise it in diseases, in which it may be heard in any part of the chest. The natural bronchial sound is always more distinct behind than in front.

41. *Bronchial* respiration is produced by any disease which affords a medium more capable than the soft air-cells of transmitting the sound from the bronchial tubes. It then becomes the *bronchial respiration* of Laennec. It is most perfect in hepatization

from pneumonia (122); less so, in effusion of fluid into the pleura (134); in tubercular condensation (156), dilatation of the bronchial tubes (189), gangrene of the lung (170), tumors, either of the lung or arteries: as for example, schirrus of the lung, or aneurism of the aorta, or of its great branches.

42. *Cavernous* or *tracheal respiration* is only an increase of the bronchial, and is usually more limited than this last. On the healthy body, listen to the air entering the trachea, and you will hear *natural cavernous or tracheal respiration*. It is heard even in the lung cavities, communicating with the bronchial tubes: tubercular cavities, for example (158): also over those arising from gangrene (170), from pneumonia (125), or from dilated air tubes (189).

43. *Rude respiration* is a mingling of the vesicular and bronchial; it is less expansive, and perhaps rougher than the former, while it usually has more expiration; but it is not distinctly *tubular*, which marks it as different from the bronchial. It is most frequently heard over a part of the lung in which there are some tubercles interspersed with healthy lung (151). We hear it in the earlier and later stages of pneumonia, before and after hepatization (118); in fact, under any circumstances which make the lungs a better conductor of sound, while at the same time the air is still able to enter the cells.

44. *Amphoric respiration* is merely a peculiar species of the cavernous, heard over a cavity with thin tense walls. It is most distinctly heard in some

cases of pneumothorax, where the bronchi communicate with the pleural sac (165). Also in tubercular and other cavities (158). It has a peculiar ring, which may be imitated by getting an assistant to breathe with some force into one extremity of a common glass lamp chimney, while the other is pressed against the palm of your hand, the back of which rests upon your ear.


45. *Jerking respiration.* This usually does not indicate very much, save some slight obstruction to the passage of air into the lung, whereby the respiratory murmur becomes apparently broken, instead of being one continuous expansion. In one case it may be of importance, and almost the only physical sign, viz. when it is heard in a very limited spot at the apex of either lung in a chronic case of pulmonary disease; while throughout the remainder of the lung no morbid sound is heard (149).

46. *Mucous respiration.* I use the term *mucous* for want of a better one, and because it conveys, in some degree, my ideas as to the cause of this variety of the respiration. Others may have noticed it. If they have done so, I am not aware of the fact. The inspiratory murmur seems more moist than natural, *almost* enough so to produce a crackling râle (72). In a few of the first cases in which I observed it, I vainly endeavored to excite a mucous râle by making the patients cough, and afterwards take deep inspirations. Sometimes, though rarely, a single bubble could be excited by thus stimulating the bronchial

tubes. I have commonly perceived it when the patient was quiet and not disposed to cough, towards the middle of the day. I have never heard it except in chronic bronchitis, and I have invariably found a mucous râle to take its place, whenever I have subsequently examined the patient, in the morning or at night, either just before or during his periodical fit of coughing.* It may be heard throughout both lungs; but it is most distinct at the lower and posterior portions. This sound has been of service to me. It has enabled me to suspect that a patient was affected with chronic bronchitis and not with phthisis, when, from the rational signs alone, it would have been impossible to have arrived at any conclusion (112). Subsequent examination has always verified my suspicion. The sound is evidently caused by an unduly moist state of the bronchi; but there is not a sufficient amount of secretion to cause a mucous râle, except at the time of coughing, when the secretions are much augmented.

* Since writing the above I have had, in my wards at the hospital, several cases of fever in which this mucous respiration was very distinct, after the subsidence of the mucous râles, that had been previously heard. In other words, the sound may be, at times, perceived in acute bronchitis or in congestion of the bronchi, about the time the acute, rational, and physical signs terminate.

AUSCULTATION OF THE VOICE.

TUDY carefully, in every case, the results obtained from the examination of the voice: for the voice affords not only signs peculiarly its own, but, in certain cases, brings out to distinctness a bronchial or tubular sound, which is not heard during the respiratory act. For example: in some cases of pneumonia (123), and of tubercular condensation (152), the bronchial respiration is wholly imperceptible during the common act of respiration, but it becomes very evident in the form of a slight blowing, during the slow utterance of words.

46. *b.* As in the auscultation of the respiration, so we hear certain sounds in that of the voice which are perfectly normal, while confined to their proper situations, but which indicate disease when heard elsewhere. In proof, I would cite bronchophony and pectoriloquy, both of which may be *natural* or *diseased*. This will become more evident by the perusal of the following.

47. Over the trachea we hear *natural pectoriloquy*. It corresponds, in place, to the natural tracheal respiration. Fig. 20, at page 34 (42).

48. At the union of the regions marked by 2, in front, and by 8, behind, we hear *natural bronchophony*. It corresponds, in place, to the natural bronchial respiration (39). *Figs. 20, 21.*

49. In health there is very little resonance in other parts of the chest; *figs. 20, 21.* It may be styled *vesicular resonance*.

49 *a.* You cannot study too frequently or too minutely the respiratory murmur and the voice in healthy persons. One of the best exercises you can have, is the daily examination of three or four individuals, who are free from thoracic symptoms. Observe the changes in the respiratory murmur, and in the tones of the voice from the trachea downward to the lowest, or most vesicular, parts of the lungs. Do this daily for three months, and you will then have mastered at least one half of the difficulties of auscultation. For, in addition to having accurately learned the characters of vesicular respiration, you will likewise have prepared yourself for the recognition of bronchial respiration and bronchophony, and when they are the results of disease, as described below (41, 42; 50 to 58).

50. The resonance of the voice may be affected by the same causes that modify the healthy respiratory murmur (25, &c.).

51. *Bronchophony* (48) is heard in any disease which causes condensation of the air-cells, but allows the sound from the tubes to be transmitted. Its intensity varies; it may be either so slight that it can

be discovered only by the minutest comparison between the sounds heard in corresponding parts of the two lungs; or it may almost equal pectoriloquy. It is heard most purely in hepatization from pneumonia (122), in dilated bronchi (188), sometimes in pleurisy (134); less distinctly in phthisis (158), gangrene (172), tumors, &c.

52. *Pectoriloquy* (47), or the highest resonance, may be heard over a *cavity* in the lung from any cause: tubercular disease (158), pneumonia (125), gangrene (172), or dilated bronchial tubes (188).

53. It is not always equally perceptible, hence the division into *perfect*, *imperfect*, and *doubtful* (158).

54. *Hægophony*, or goat-like resonance, occurs in some cases of pleurisy, when only a thin layer of fluid is between the ear and the surface of the lung. Hence it is thought to be an important sign in pleurisy (135). It indicates, when heard perfectly in the earlier stages, that there is little fluid effused. When it occurs after a severe attack, and during which the sound was absent, it shows that there is a diminution of the amount of fluid effused.* Its peculiar characteristic is sharpness of tone. By compressing the nostrils and speaking quickly in a high key, you will produce sometimes very perfect hægophony, especially if your voice incline to be somewhat treble in its tones. This is the mode whereby

* This is in general true; but I have obtained a *modification of the voice*, resembling hægophony or bronchophony, in some cases in which the pleuræ were filled with fluid.

Punch produces his peculiar voice, and Laennec compares this sound to his tones (135).

55. Pure hægophony is rarely heard ; but some *modification of the voice*, between hægophony and bronchophony, is always heard in pleurisy ; and this I conceive to be more important than the hægophonic character itself. Another fact which makes hægophony less valuable is this : it is heard at times when there is merely a membrane covering the pleura, &c.

55 *a*. A sound, intermediate between hægophony and bronchophony, has been lately proposed by Dr. Christophe. He calls it *ægony*. "It is a diminutive of hægophony, and may be considered as a part of that sound." It "signifies a chronic dry pseudo-membranous pleurisy, accompanied generally by a subjacent induration." This induration is commonly due to "a thick crop of tubercles" in the part of the lungs corresponding to the spot where hægony is heard. Autophony (58 *a*) is almost always present. *Ægony* seems to me to be of little importance.

56. *Diminished* resonance of the voice is much less common than some modification of its tone, or than increase of its resonance ; still, I have met with it in some early cases of phthisis (152), emphysema (179), &c. It may be well to retain it in the memory.

57. Finally : it is of no importance for the pupil to trouble himself to decide, definitely, whether he hears *bronchophony*, *hægophony*, or the various kinds

of *pectoriloquy*. It is sufficient that, on a comparison between the lungs, he finds an *increased* or *diminished* natural resonance in any part. The other physical and rational symptoms, when combined even with these, apparently, doubtful signs, will enable him to arrive at a correct diagnosis. He must, however, bear in mind the different sizes and shapes of the two primary bronchi (*fig. 22*) ; which facts usually cause *a little more vocal resonance at the top of the right lung*, than of the left.

58. GENERAL REMARKS. In examining a patient for the respiration or voice, we must, in order to be very accurate, remember the rules above given (1, 2, 25, &c.).

58 a. *Autophony*. It has been proposed to notice the peculiarities in the resonance of the auscultator's voice. Hence the derivation of the word autophony. The auscultator places his ear upon the patient's chest, and then speaks aloud, the patient remaining silent. Different effects, it is said, are produced, according to the condition of the parts under the ear. But the differences are generally trifling in comparison with the phenomena produced by the patient himself. The subject is, however, worthy of your attention.

RÂLES, OR RHONCHI.

DURING inspiration, and more rarely during expiration, there are heard, in several diseases, certain sounds, called râles, rhonchi, or rattles. They are various in their qualities, and they may be heard in all parts of the chest: some are more or less permanent, while others are very volatile. At times, some of them are brought to existence only by coughing, or by a long inspiration; in other cases, they may be, with equal ease, destroyed by the same acts.

59. These râles never exist in perfectly healthy chests; they always indicate disease, but this disease may vary from the slightest swelling of a bronchial membrane, to the ulceration and destruction of an entire lobe of one lung.

60. There are two great divisions, consisting, 1st, of those sounds produced in the bronchial tubes, or in the cavities connected with them; 2d, of those connected with the pleura, and unconnected with the tubes.

61. The first of these divisions may be subdivided into (*a*) canorous or musical tones, and into (*b*) crackling râles, rattles, or rhonchi.

62. In (*a*) are the *sibilant* and *sonorous râles*. They indicate a condition of the lung whereby the air is not prevented from entering the most minute parts, though it enters with difficulty. They occur in asthma (180), where there is usually swelling of the mucous membrane of the bronchial tubes, in bronchitis (106), typhoid fever, &c. They are most evident during an attack of asthma, and, in this disease, they are usually heard all over the chest, and vary from the sound produced by a violent gale which blows until it whistles, to the soft cooings of the dove, or the deep tones of the bass-viol.

63. The *sibilant* closely resembles the wheezing sound sometimes heard in the nostrils, in cases of inflammation, and of congestion of those parts; and as this wheezing frequently runs into a kind of whistle or snore, so the *sibilant* in the chest joins the *sonorous* and alternates with it.

64. Both of these sounds may, to a certain degree, be imitated by inhaling strongly through the lips, when partially closed, but at the same time rendered flexible, in which case a slight, soft hiss is heard. By contracting the lips, and by making them more tense in expiration, a kind of whistle is produced. The former resembles the *sibilant*, the latter the *sonorous* *râle*. This experiment perhaps will explain the philosophy of the two sounds. In slight attacks of bronchitis (106) we hear the *sibilant*, but in violent attacks of asthma we have the *sonorous* most manifest. They are both very fugitive, being heard

one moment and disappearing the next, owing to the removal of the obstruction from the bronchial tube. A single act of coughing may produce or destroy them. They are most permanent in asthma, when they occasionally last several days, and a *sibilant* condition of the respiration sometimes continues for months, owing to a chronic thickening, and congestion of the mucous membrane (106, 180).

65. Not unfrequently, a sound like a single whistle or sonorous r le is heard under the clavicle, while in the remainder of the chest there is a healthy vesicular murmur. This strongly indicates the existence of tubercular disease, if the patient be suffering from a chronic affection; especially if it be connected with any other, distinctly morbid, physical or rational sign (153).

66. *Metallic tinkling* is a sound resembling that produced by some wire toys, and can be produced very readily by the following experiment. Into a bladder half full of water, introduce a catheter, and let an assistant blow into it while you have your ear upon the outside; as the bladder becomes more tense, the sound of the bursting bubbles becomes more metallic, until, at length, the pure metallic tinkling is produced. On shaking the bladder the same sound is heard. It occurs in diseases wherein a bronchial tube communicates with a cavity, having thin and tense walls, either in the pleura, or in the substance of the lung. In pneumothorax (164) it is most perfect, but it is, at times, very distinct over a tuberculous cavity (158).

67. *Metallic Echo* is a ringing respiration, without tinkling, occurring under similar circumstances.

68. In the second subdivision (*b*), are found the crackling râles, viz. the crepitous, sub-crepitous, mucous and muco-crepitous, and gurgling.

69. These produce the sensation as of the bursting of bubbles, and there is a regular, gradual increase in their size and in their other qualities, from the most minute crepitous râle to the loudest gurgling. Notwithstanding the marked difference between the *crepitous râle* and *gurgling*, the intermediate degrees are often difficult to be distinguished; but *these differences are of no real importance*, because they are heard in connexion with other signs, which aid the diagnosis.

70. The *crepitous râle* is a sound like that produced by the crackling of salt, when thrown upon the fire, or by the rubbing of the hair, near the ear, between the finger and thumb. It may also be artificially produced by pressing a dry sponge upon a thin book or pamphlet previously placed against your ear. It may be heard by placing your ear upon the lung of some animal, while an assistant inflates it; or, still better, by pressing the ear upon a hair pillow. These last two experiments produce an explosion, as it were, of myriads of very minute bubbles, apparently of uniform size, such as we often hear during inspiration in some diseases. When this sign is heard in the human chest, it commonly indicates either the first stage of pneumonia (120) or its period of reso-

lution, or œdema of the lung. I have met it recently in some cases of fever, in which there was more congestion of the lungs than usual. It was very transitory, however. In all the cases it was most distinct immediately after the patients arose in bed for examination, and when they were making their first full inspirations. It always disappeared under the influence of three or four long inspirations. In two cases of distinct tuberculization, followed by fatal phthisis (155), this râle was heard for weeks, limited to the spot where the tubercles were most developed at the autopsy. This is a very rare cause of the sound (195).

71. The *mucous râle* is a louder, moister, more *irregular* râle, than the crepitous.

72. It is most often heard in acute bronchitis, with copious expectoration ; and towards the base of the lung (107).

73. The *muco-crepitous*, *sub-crepitous*, and *sub-mucous*, are merely intermediate steps to suit the fancy of auscultators, according as the sound approaches more nearly the mucous or crepitous. These, with the *mucous*, indicate mucus in the bronchi, or cavities. A similar râle is not unfrequently heard in phthisis, at the *upper* part of the lung (156) ; and in pneumonia (124), and in dilated bronchi (190), usually at the *lower* part.

74. *Gurbling* is the largest and most irregular bubbling, and indicates a cavity in the lungs. A single bubble is sometimes sufficient to mark it ; for

it is most commonly combined with cavernous respiration (42). At times a cough will produce it, when simple respiration will not. By closing the mouth, while we are gargling the throat, we may hear a somewhat similar sound.

75. **EXAMPLES.** A tubercular patient has this sound under the clavicle, when there is a cavity; and in this case it is the most distinct (158); but it may be heard in cases of gangrene of the lung (171), or of pneumonia, when an abscess is formed, with a loss of a part of the substance of the lung, and where the cavity thus formed communicates with the bronchi (125).

76. **N. B.** Irregular cracklings (mucous, mucocrepitous, or gurgling) at the top of either lung, while the rest of the organs are free from any morbid sound, indicate strongly, in a *chronic* case, the existence of phthisis; when at the bottom of the lungs, they mark bronchitis or dilated bronchi; when heard anywhere, in an *acute* disease, and combined with a dullness on percussion, or an alteration in the sound of the voice, and in the vesicular respiration, they indicate pneumonia.*


* Recently "a new physical sign" has been noticed by Dr. F. J. Bigelow, in a patient under his charge at the hospital. "It is a rapid ticking sound in the throat, audible across the room, involuntary and independent of circulation or of respiration, a phenomenon interesting from its anomalous character rather than its diagnostic value." It occurred in a young woman who had suffered much from pain and swelling of the right side of the head, about the ear and parotid. In March, 1846, it commenced, and had continued with little

77. In the second division we have only one sound, viz. the *rubbing sound* (bruit de frottement). It is occasioned by roughness in the two layers of the pleura, which, during respiration and the consequent motion of the lung, produces a rubbing sound. This roughness is, usually caused by pleurisy. Any organic change, however, such as emphysema of the lungs, and cancerous and other diseases of the pleura, which give a roughness to the parts, may cause it. It has various subdivisions, according as it is more or less harsh, viz. the slight rub (bruit de frôlement), and the grating sound (raclement): but there is no difference, except in degree (128, 135). The rubbing sound, and some of the other crackling râles, are at times distinctly perceptible to the hand when placed upon the chest.

78. **EXAMPLES.** The simplest form of this sound occurs when there is a slight dryness of the membrane, and on the earliest effusion of lymph in pleurisy (128). In the later stages, after a copious effusion and a subsequent absorption of a fluid, it is rougher (141). It is but rare that it is heard in any other disease.

79. A modification of this sound has lately been intermission since. "It is audible to bystanders, and resembles very much the clicking of the electro-magnet attached to the telegraph. It is referred by the patient to the upper part of the thyroid cartilage. No satisfactory explanation can be given of its cause, although doubtless it is in some measure owing to a spasmodic affection of the muscles about the fauces and larynx."—*Vide Boston Medical and Surgical Journal*, Nov. 3, 1847.

noticed, under the name of the *pulmonary crumpling sound*, as pathognomonic of the early stages of phthisis. As the name indicates, it seems as if one heard, directly under the ear, a sound like the slight crumpling of parchment. I have heard it twice in apparently early stages of tubercular disease. It was connected with no other physical sign, and occurred at the end of inspiration. Both patients had had hæmoptysis ; both apparently regained their health.*

80.  REMEMBER THIS RULE. *Do not trouble yourself so much about nice distinctions of sound ; but observe accurately, first, where the sounds are heard ; secondly, where the focus of them is, supposing that they exist everywhere in both lungs ; and thirdly, their combinations with other physical and rational signs.*

81. N. B. A very small sign at the apex of the lung is of much more serious import, than very loud and extensive râles in every other part ; for the one points to phthisis ; the other to bronchitis, dilated bronchi, &c. Remember, therefore, always to compare the signs in the upper part of the lung with those in the lower ; and, in case the râles are very

* Since the above statement was made, I have again been consulted by one of these individuals. Having, at my advice, quitted the north, and entered into business in one of our south-western cities, he had for many years enjoyed uninterrupted health. Within the past year, however, his cough has returned with rational signs indicative of phthisis ; and manifest physical signs, gurgling, pectoriloquy, &c., confirm the diagnosis,

general, if you find only an inch even of the lower part of the lung free, while the rest is affected with râles, you may be sure of having to deal with something more than mere bronchitis. In this case, you will commonly find the evidences of disease to augment as you approach the apex.

PERCUSSION.



PERCUSSION is more difficult to perform delicately than auscultation. Like the latter, it is either *immediate* or *mediate*.

83. By *immediate percussion*, we mean the striking of the chest with the hand merely, without any intervening substance. This mode is now rarely used, because its results are inaccurate, in comparison with those from *mediate percussion*.

84. In *mediate percussion* we place some body on the chest, and strike upon that rather than on the chest itself. This body is called a plessimeter. I usually find the fore-finger of my left hand sufficient for this purpose. The object of a plessimeter is to compress *gently* but *firmly* the soft parts, so as to form a dense vibrating surface over the part of the lung that is examined. After this compression, we strike upon the plessimeter, as we do in *immediate percussion*. Be careful when using your finger as a plessimeter, not to put the back of it upon one portion of the chest and the inside of it upon another. A different sound is produced in the two cases. The rules given

in (1, 2) must be *more* strictly attended to in percussion than in auscultation.

85. Various plessimeters are used by different practitioners. Among these, the following are the

Fig. 23.

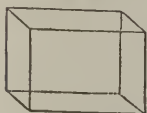
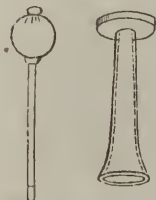


Fig. 23 is a simple cubic block of caoutchouc. It should be of moderate size, large enough to be easily held between the thumb and finger, while it can be likewise laid flat in a small space; as, for instance, behind the clavicle.

86. *Fig. 24* shows the stethoscope-plessimeter and

Fig. 24.



percussor used by Professor Bigelow. It is chiefly useful when examining behind the clavicles; because by it we are enabled, better perhaps than with any other plessimeter, to make equal degrees of pressure behind both clavicles, and at like angles (21).

87. *Fig. 25* is a piece of very thin smooth ivory. It is Raciborski's instrument. Piorry's is similar,

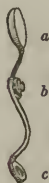
Fig. 25.



and is usually fastened to his stethoscope. These instruments give a very clear resonance, but the sound has the tone of the ivory, and therefore is not so pleasant to me as the finger or the India-rubber.

88. *Fig. 26* is the instrument proposed by Drs. Cammann and Clark. It is a very delicate appara-

Fig. 26. tus, made chiefly of polished steel. In the plate, *a* is a handle of ivory, riveted to the steel; *b*, a small plate of ivory for the thumb to rest upon; *c*, an oval plate of steel, upon which is fitted a piece of caoutchouc, to prevent any noise from the striking of the finger upon the bare metal. Beautifully constructed as this is, I suspect it will be rarely used; for it is too bulky for every day practice, and moreover is not absolutely necessary, even for auscultatory percussion (386).



88 *a.* The following plates represent the plessimeter and percussor prepared by Dr. C. J. B. Williams, of London:

Fig. 27. is a percussor or hammer made of a rod of whalebone, four or five inches long, and having an oblate spheroid of lead, three quarters of an inch in its long diameter, fastened to one extremity. This lead is covered with buff leather and velvet, to deaden the sound. *Fig. 28* is a plessimeter, made of a stout



Fig. 28.

narrow piece of whalebone, about four inches long and slightly bent by heat, so that one end forms a handle, whilst the other, covered with leather and velvet, fits readily between the ribs, and can be firmly applied.



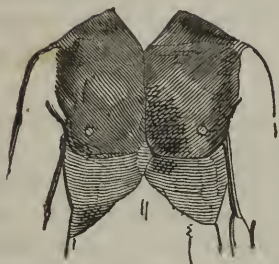
89. The sounds on percussion of the chest are either *natural*, *augmented*, *diminished*, *changed in note or pitch*, or *absent*.

90. The *natural* resonance is greatest where there is the least muscular substance covering the chest ; hence the axilla, the side, the lower part of the breast and below the scapula, give more resonance than the other parts.

91. These places vary in importance. Some give so little sound—as, for instance, the tops of the shoulders—that they are most unwisely neglected by some auscultators, as giving no definite results. In all cases of chronic cough I regard them as the most important, for they are the first affected in the earliest stages of phthisis (143).

92. The following plates will give, in a *rough* manner, an idea of the different degrees of sonorousness of various portions of the chest. I have endeavored to represent these different degrees by the lighter and deeper shadings ; the darker points being the more dull on percussion.

93. *Fig. 29* presents a view of the front of the thorax. Above the clavicles, especially towards the top and outside of the shoulders, little sound is obtained. This is a place difficult of percussion, but of infinite importance in suspected phthisis (143). Below, we find a *difference of note or of pitch* (99), between the two breasts, extending over a somewhat triangular space, from the second or third rib, downward to the sixth. This is owing to the position of the heart, the aorta, and the great vessels which lie under the sternum, and on a level with the second rib, thence extending downward. About the fifth rib,

Fig. 29.

over the cardiac ventricles, is a duller space, and one which is sometimes quite flat, for the extent of about two inches in circumference. The outsides of the breast of course are dull, owing to the pectoral muscles. The mamæ, likewise, in women, cause flatness. They do

not, however, interfere so much as one would anticipate, for we can raise and depress them considerably, and thus avoid the necessity of striking directly upon them.

94. *Fig. 30* shows that less clear sounds can generally be obtained from the back than from the front. For instance: the tops of the shoulders, the

Fig. 30.

scapulæ, especially towards their exterior edges, and both sides of the vertebral column, are very dull, almost flat. Below the angles of the scapulæ, we get very clear sounds; fully equal, and sometimes superior, to those obtained on the front of the chest. The tops of the shoulders, though the darkest on the diagrams,

as being capable of producing but little sound, are however very important when compared together (2, 5). The slightest *difference of note* or of *pitch* (99), *combined* with other physical and rational signs, will perhaps decide your diagnosis. In order to percuss well in these parts, the scæleni muscles must be compressed very firmly.

95. *Fig. 31* presents profiles of the back and breast, and a front view of the most resonant portion

Fig. 31.



of the chest, viz. the axilla and the parts below. This part, though the most resonant, is of the least importance; because a disease rarely shows itself here, until it has made very severe and evident ravages, either in front or behind.

96. The sound is *augmented* by strong inhalation, emphysema (177), pneumothorax (166), &c., in short, by anything that increases the quantity of air in the chest. Some-

times also hepatization of the posterior part of a lung has been detected from an extraordinary resonance in front (123). I have often observed an increase of resonance in some cases of early phthisis (148).

97. **EXAMPLES.** Pneumothorax gives the loudest sound; next comes emphysema. At times there is

great resonance in phthisis, owing, I think, to the fact, that the vesicles near tubercular deposits are frequently emphysematous.

98. It is *diminished* by anything that drives out the air. An effusion of fluid in the pleura (130), pneumonia (122), tubercular (146, &c.), and other organic changes in the lungs; an unusual quantity of fat; a constrained position of the body; or pain on motion of the ribs may produce the same effect (102).

99. A *difference of note or of pitch* between two corresponding parts is not uncommon, when there is no real flatness in either (146). It occurs in cases in which the lung is not by any means impervious to air. Sometimes in the early stages of phthisis (146), and of pneumonia (123), in its early or latest stages.

100. There is a peculiar sound produced at times when percussing over a cavity with thin walls, or sometimes, but much more rarely, in hepatization of the upper lobe of the lung. It is called the *cracked-pot sound* (bruit de pot fêlé), and its name explains itself. In itself it is not of great importance. Sometimes, when there is a slight jar about the clavicle, or the percussion is badly performed, a sound similar to this is produced. Hence caution is needed.

101. At times, the sound seems to be as entirely *null* or *absent*, as when the thigh is struck. This degree of dullness of sound indicates most serious disease. It is usually owing to an effusion of fluid into the chest; with a greater or less compression of

one lung. More rarely, the dullness is as great in very extensive and severe hepatization from pneumonia, gangrene, &c. Malignant and aneurismal tumors may cause a similar degree of dullness, but, in these cases, it is local.

102. **EXAMPLES.** Fluid in the pleura will, of course, push aside the lung, and cause the greatest degree of dulness ; the want of sound from pneumonia is rarely so perfect. Tubercles rarely cause perfect flatness, while gangrene of the lungs very commonly does. In fat people, an ivory plessimeter is good to compress the adipose matter, and to bring out a good sound. The position of the body is of vital importance in examining differences of note or pitch, in the earlier stages of phthisis ; a slight deviation from symmetry in the position of the two sides of the thorax, being fatal to accuracy. In pleurisy pain sometimes prevents the ingress of air, hence arises a difference of note or of pitch between the affected side and the other.

102 *a*. Percussion is of great importance in all pericardiac and cardiac diseases (248).

PHYSICAL SIGNS OF LARYNGEAL DISEASES.

BARTH and Roger mention, 1st, the "harsh laryngeal respiration," 2d, the "sibilant," 3d, the "sonorous" (63), 4th, the "cavernous and gurgling" (74), and 5th, the "flapping râles;" as indicative of laryngeal affections.

The 1st attends acute and chronic laryngitis; tumors compressing the trachea; croup.

2d. Spasms or œdema of the glottis; stridulous laryngitis; foreign bodies in the trachea; compression of the trachea.

3d. Laryngeal ulceration and vegetations: croup.

4th. Hæmoptysis; laryngeal ulcerations; foreign bodies in the trachea: death-rattle.

5th. Croup with partially detached membrane in trachea.

103 a. I have rarely used auscultation in these affections. It *may* aid you in their diagnosis. I have usually found the rational and other logical signs much more important, but in the case of an old man who consulted me for a chronic cough, the auscultation of the larynx afforded me important indications. I could not find in his case any signs of disease of the

pulmonary structure, but a slightly stridulous respiration was heard throughout the chest. This was evidently dependent upon some disease of the larynx, for a loud sibilant and sonorous respiration was heard over the thyroid cartilage, and was thence conducted into the bronchial tubes, becoming less distinct as the stethoscope was further removed from the upper part of the neck. The local application of lunar caustic removed the difficulty.

PHYSICAL SIGNS OF BRONCHITIS.



As there are two kinds of bronchitis, viz. *acute* and *chronic*, so their physical signs are different.

105. In certain cases, of both kinds, you may get no physical signs.

105. EXAMPLE. Let an individual be affected in the larger bronchial tubes, and have but little expectoration. In such a case, there is nothing to produce physical signs, because there is nothing which seriously obstructs the passage of the air in its circulation through the bronchi. This absence of signs is very common in chronic cases. These cases are sometimes very obscure, and the patient may present some of the rational signs of phthisis. The diagnosis of the two becomes very important as well as difficult. The rule in regard to the *time* at which auscultation should be made (pp. 9, 10), and the sign called *mucous respiration*, should be strictly attended to (46).

SIGNS OF ACUTE BRONCHITIS.

106. In the earliest period of the disease, a sonorous, or sibilant râle (62), or both combined, are

heard in various parts of the chest ; chiefly, however, at the middle and lower parts of the back. If they be found all over the chest, they are, usually, more distinct at the lower than at the upper part. They are owing chiefly to a thickening of the mucous membrane of the air tubes.

107. As the disease augments, and expectoration begins, the crackling râles commence, and these likewise are usually heard most distinctly at the bottom of the lung. They may be *mucous* (71), *submucous*, *mucocrepitous*, or *subcrepitous* (73). All of them may be mingled with the sonorous and sibilant ; but, usually, in this stage of the affection, the sonorous and sibilant are less constant than in the previous stage, owing to their being caused more by obstruction, from the mucous secretions remaining in the air-tubes, than from a thickening of the mucous membrane of the bronchi.

108. As the disease subsides, and the expectoration diminishes, because the mucous secretion is less, these various râles all diminish, and are heard last in the lower parts of the lungs.

109. Finally, nothing manifestly abnormal is observed, except a few crackling râles, during an access of coughing either in the morning or evening ; but during the remainder of the day, nothing is perceptible, except a slight *mucous respiration* (46), and perhaps a little less expansiveness than usual in the respiratory murmur (45).

110. It seems as if there were a little moisture in

the minute bronchi, and only a little more were needed to produce *pure* mucous râle. This increase of secretion actually occurs, with the production of *mucous râles*, about the time of the usual fit of coughing ; but at other portions of the day the membrane is drier, and the *mucous respiration* alone is heard.

111. N. B. Hence the importance of examining such doubtful cases during the period of the usual access of cough, whether that period occurs early in the morning before rising in bed, or late at night.

112. The respiratory murmur, except that it is sometimes obscured by the râles, or temporarily lost owing to mucus in the tubes, the resonance of the voice, and the sound obtained by percussion, are natural in acute bronchitis.

SIGNS OF CHRONIC BRONCHITIS.

113. They may be wholly absent where there is no mucous secretion. The sonorous râle (62) is rarely heard, and is never so constant as in the acute form. A mucous râle (71) heard occasionally in various parts of the chest, but chiefly at the base, is the most striking phenomenon. The *place* in which this râle appears will generally enable you to distinguish bronchitis from phthisis (81, 143).

114. The respiratory murmur may be a little roughened or obscured, as in acute bronchitis (113). The resonance of the voice, and the results of percussion, are normal in chronic bronchitis.

115. EXAMPLES. A man is seized with febrile

symptoms ; and perhaps will have some wheezing in the nostrils, which, in one or two days, may extend to the lungs. At this period, the sibilant and sonorous râles are heard ; indicating congestion and thickening of the mucous membrane. This stage usually lasts less than a week, and gradually runs into that in which the crackling râles will appear. These are owing to a secretion from the bronchial mucous membrane ; and with them usually comes some relief to the active congestion. They may last indefinitely. In a severe case, they rarely wholly disappear before the lapse of three or four weeks ; and, in some feeble persons, they continue as many months. They are heard at the *bottom of the lungs* ; or they alternate with the mucous respiration (46). Finally ; all the râles may disappear, while the cough will remain, owing to a thickening and an irritation of the membrane in the larger bronchi.

During all these periods, there is no *serious change* in the respiratory murmur. It may be obscured, or it may be wholly absent for a time, owing to a portion of mucus obstructing a tube, but a full breath, or a cough, will reproduce it. There is no change in the sounds of the voice, or in the results of percussion ; and if, perchance, in a case of *suspected* bronchitis, you perceive any modification of either, you may be sure that you are wrong in your diagnosis, and that you are dealing with some disease possibly much more serious ; probably either with pneumonia (122), pleurisy (135), or phthisis (153, 154).

116. A. B. called at the Infirmary for the Diseases of the Lungs. He had chronic cough, which he suspected to be "consumptive" in its tendencies. I found no physical signs to confirm this view ; but, instead, I heard *mucous respiration* at the bottom of both backs. I learned that he had, usually, his most severe periods of coughing early in the morning. Accordingly, I delayed my diagnosis. Visiting him at six the next morning, I found him in bed, according to appointment, having made no effort, and having had no cough. The exertion needed in the examination produced a cough, and distinct *mucous râles* were heard at the bottom of both backs, or, in other words, at the precise spots where *mucous respiration* was heard at noon of the preceding day. Thus I was confirmed in two views, viz. 1st, that *mucous* respiration indicated a smaller degree of secretion from the bronchi than that necessary to the production of râles ; and 2d, that the case was one of bronchitis and not phthisis (116, 143).*

* Since the publication of the first edition of this work I have met with many examples entirely similar to that of our Infirmary patient.


PHYSICAL SIGNS OF PNEUMONIA.

THIS disease may occur in any part of the lung, and you must examine more carefully than in bronchitis. Most frequently, however, it commences in the lower lobe (*fig. 18*), and thence extends, involving the whole of that lobe, or the greater part of 9, 6, and 5, and perhaps 4; sometimes the whole lung.

118. The *first* signs are, either a diminution or an increase (28) of the natural respiratory murmur. I have seen a case of the former; but have not met with a case of the latter. Sometimes there is a *rudeness* or roughness of the respiration (43). Ordinarily, however, these abnormal sounds are rarely observed, because this stage lasts but a few hours, unless the inflammation begins in the centre of the organ, and thence extends to the surface of the lung. In this case the diminution may last for some days. At times, we hear an increased respiratory murmur around an inflamed part, in which a crepitous râle and a bronchial respiration are the most prominent signs of inflammation. In such a case, the *probability* is, that you will hear crepitation in that part within twenty-four hours.


119. **EXAMPLE.** I once had a case, in which there were marks of severe febrile action in the system, and pain in the right side of the thorax ; but no physical signs, except an obscurity in the respiration about the right scapular region ; until, after the lapse of three or four days, a fine crepitous râle came up, apparently from the deep seated parts, to the surface of the lung ; and a plain case of pneumonia then became evident. In this case, I presume that there was some internal pneumonia which extended outward.

120. The *second* sign, and what is usually first heard by the physician, is a crackling in the inflamed portion. It may be coarse, but usually it is a very minute *crepitation* (70). When you hear the latter, you may be sure that the first stage of pneumonia, or congestion of the lung, has commenced. The voice may be slightly altered, and the percussion may give a change of note ; but they may both be entirely normal (99).

121.  Sometimes, the crepitus is heard only at the first inspiration, after the patient rises from examination ; at others, a cough, or a long inspiration, or both combined, will alone produce it. When pure and most distinct, it resembles an explosion of myriads of very minute, regular, and dry bubbles, and is heard during inspiration (70).

122. The *third* sign, and the one which marks what is usually called the second stage of pneumonia, or red hepatization, is bronchial respiration (41).


With this you will have bronchophony (51), and dullness on percussion (98).

123.  The type of morbid bronchial respiration (39, 40, 41) may be heard in this stage of pneumonia. Sometimes, however, it is but faintly heard, except during the act of speaking (46 *a*), and hardly at all during that of respiration. The bronchophony (48, 51) likewise varies; being sometimes a slight modification of the voice; while, at others, it is almost like pectoriloquy (47, 52). The dullness on percussion is very rarely so great, as that found in pleurisy (101). Hence, merely a *change of note or of pitch* (99) is of consequence in the diagnosis of pneumonia. Twice I have observed a very curious phenomena in this stage of pneumonia, of the posterior portions of a lung; viz. an almost tympanitic state of the breast (96). Palpation at this period shows an increase of the natural tremor of the thoracic parietes during the act of speaking (14).

124. If the patient begins to recover, you will hear a crackling ("*returning crepitous râle*") (70), as the lung becomes softer, and the air again enters the minute cells. This is, at first, minute; but in a few days it becomes larger (sub-crepitous) (73). The voice becomes more natural. But the results of percussion are, at times, apparently unfavorable, for the dullness augments as the other signs improve. I presume this is owing to an œdema of the lung, similar to that which comes on after an external inflam-

mation; whereby the parts become more swollen than they were during the acute stage.

125. But if the lung suppurates, you will hear a large, irregular crackling, and, perhaps, gurgling. The pure bronchial respiration and the bronchophony disappear; and instead of these, you will hear a rude, indistinctly tubular sound (43), and a less clear resonance of the voice; unless, indeed, a cavity forms; in which case, you will probably hear gurgling (74), an obscure cavernous respiration (42), and perhaps pectoriloquy (52). The sound elicited by percussion during this stage is not very different from that observed in the second stage.

126.  The description given above, strictly speaking, applies only to adults; for, although the same phenomena *may* occur in children, still, in these latter persons, the râle *usually* is less fine, and is heard more universally over the chest. The bronchial respiration and bronchophony *may* be wholly absent. It is rare, moreover, that the results of percussion are so manifest in children as in adults. If, in a child affected with a great febrile excitement, owing to a severe pulmonary trouble, I find râles everywhere in the lungs, especially if they are minute, I *fear* that the case will prove serious, and suspect pneumonia. If, with these circumstances, a dullness of sound is heard on percussion; particularly if one side of the median line is duller than the other; I feel *certain* that pneumonia exists (2, 3).

127. EXAMPLE. A man is seized with fever and

cough, accompanied by rusty, viscid sputa, fever, &c. ; and if he be examined within forty-eight hours, you will, in the majority of cases, hear a crepitation, with a change in the tone of voice (57), and a difference of note or of pitch (99) on percussion ; or, in other words, signs of a partial hepatization of a portion of one of the lungs. The disease augments ; and the crepitous râle disappears, at least in part, usually in twelve or twenty-four hours, leaving a pure bronchial respiration (41), and bronchophony (51). The percussion, which previously has not given very marked results, probably nothing but a modification of note, now produces a dull sound (98). This stage continues longer than the first, usually from three or four days to a week ; but towards the latter part of this time, a returning crepitous râle (70) begins to be heard on coughing, or on any active effort to inspire deeply. From the end of the fifth to the tenth or twelfth day, the bronchial respiration begins to diminish, and becomes daily less and less clear ; the crackling becomes louder and more irregular. The dull sound on percussion, on the contrary, often continues to augment. Finally ; by the sixteenth or seventeenth day, the bronchial respiration will have wholly disappeared ; but the râles may remain, in a slight degree, with some dullness, for weeks after full convalescence.

PHYSICAL SIGNS OF PLEURISY.

IF you are fortunate, you may hear, as the earliest sign, a diminished respiration on the affected side, owing to the unwillingness of the patient to expand the chest. The pain prevents him from doing so. But, generally, the first sound heard is a *rubbing sound* (77), owing to the dryness of the pleura ; and it will be most manifest where the lung moves most, either in 4, 6, or 10 (*figs.* 20 and 21).

129. EXPLANATION. With each act of respiration, the two layers of the pleura lubricated as they are in health, move noiselessly up and down, one upon the other. In pleurisy, they become dry, or have a thin deposit of lymph on each surface ; and, of course, produce some sound when they are rubbed together. The sound at this period is of milder character than that heard at a later stage (78).

130. Among the first symptoms is dullness on percussion (101) in 10, *fig.* 21, owing to an effused fluid and the gravitation of it towards the lower part of the chest. You may mark the height of the liquid by the dullness, and no disease of the chest destroys all sound so entirely as a pleuritic effusion. The extent of the flatness increases with the quantity of fluid,

and, as it is sometimes so great as to fill the whole of one pleura, you will perceive absence of sound throughout (28). In this case, the lung is wholly compressed against the spine.

131. When percussion does not reveal at once the existence of fluid in the chest, advantage may be taken of the effect produced by changing the position of the patient. If there be no adhesions of the lungs any fluid in the pleura will gravitate to the lowest part, and its level will vary with reference to the thoracic parietes according to the position of the patient. I have met with one or two rare cases in which a change of posture produced no difference ; in consequence, I presume, of old adhesions preventing any motion of the fluid.

132. Since an effusion of fluid causes, as we have seen (130), a partial or total compression of the lung, the respiratory murmur is diminished, or it may entirely absent ; and in this case we find a puerile or increased murmur in the healthy parts (25, 28), and throughout the other lung.

133. Some speak of a hægophonic respiratory murmur. It seems to be a mingling of the bronchial and the vesicular, or it is an indistinct bronchial respiratory murmur (80).

134. At times, however, a distinct bronchial respiration (41) is heard, even when there is a pleuritic effusion ; but this is rare. I have met with two cases, in which that sound was as distinctly bronchial as I ever heard it in pneumonia. Nevertheless, the differ-

ential diagnosis between pneumonia and pleurisy is usually not difficult; inasmuch as, in pleurisy, there are usually none of the râles of pneumonia, and the dullness on percussion is greater in pleurisy than in pneumonia. Change of posture produces no effect in pneumonia, but affords very important signs in pleurisy (131).

135. The voice is always *modified* (55): at times it is simply diminished, when the effusion is very small or very great. When only a thin layer is between the lung and the outside of the chest, we get *hægophony* (54). Hægophony is favorable after extensive effusion, because it marks a diminution of the fluid, and if it be followed by the rubbing sound (77), your patient recovers very soon afterwards.

136. This is the old statement by Laennec, and it is generally followed by other writers; but, of late, not a few have found that hægophony may exist when there is a great effusion. I have heard it, in one case, in which the chest was found so full of fluid that the lung was almost wholly compressed.

137. When there is an effusion to a great amount, there is an *enlargement* of the diseased side, and when the patient recovers there remains permanently a *contraction* of the same, drawing down the shoulder, and causing an apparent projection of the lower angle of the scapula (16, 17).

138. In some cases, I have known this falling back of the scapula to be a serious annoyance to the patient; by causing the arm of that side to swing

towards the spine, rather than in a plane parallel to the side of the body; whereby a difficulty in walking was produced (142).

139. *Immobility* of the thorax is consequent upon a large effusion, and the slight thrill which is experienced when the hand is placed upon a healthy chest is, in such cases, destroyed. Neither of these signs, however, is of much importance when compared with others (10, 14).

140. When the effusion is great, all the adjacent organs are liable to displacement. The heart may be pushed wholly to the right side, the liver may be thrust down below the cartilages of the ribs, &c. So, likewise, when contraction ensues, after absorption of the fluid, these same organs may be drawn out of their places.

141. EXAMPLE. *First.* A man may have no *rational* signs, and then the physical signs detailed above become of vital importance. The disease is, in fact, wholly *latent* without them. Fever and pain in the side, with a slight and difficult cough, without expectoration, usually accompany the disease, and in these cases we find, within the first two days, either a *rubbing sound* (77), from the layers of inflamed pleura moving upon one another, or a diminished respiratory murmur, since (28) the pain in the side prevents a full expansion of the lung. *Second.* The disease goes on; and, within a week, a *dullness* (101) of a most marked character, though over a small extent, is observed in the lower two or three inches of either

back. With this comes a still greater diminution of the respiratory murmur in the same parts ; although, owing to the subsidence of the acute pain in the side, it may have augmented in most parts of the lung. A slight *modification of the voice* (55) frequently appears at this period. Change of posture will begin to be serviceable. Let the patient lean backward from the side of a chair ; let an assistant support his shoulders, while you strike on the back. Keeping your finger upon the highest point in the back that becomes dull in this posture, let the patient stand up and lean over so that the trunk shall be again horizontal ; but the breasts, being the most depending parts, will now be flat, while the back, previously flat, will emit a clear sound. In this manner, a very small quantity of fluid will be discovered. *Third.* The effusion augments and hægophony (54) appears ; perhaps half the chest will be found filled with fluid ; the flatness rises together ; the respiration becomes null (28) or is but very slight in the lower parts of the back. The sides begin to be enlarged (8) ; the intercostal spaces to swell out. *Fourth.* The greatest degree of effusion may occur, and the whole lung become compressed ; the parietes are then immovable (10), enlarged, perfectly flat even as high as the clavicle and on the top of the shoulder (130) ; the respiration is null (28) ; and hægophony (54) usually disappears. At this period the organs, liver, heart, &c., are displaced as described (140). This state of things, under bad circumstances, may occur within

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a fortnight from the attack ; and it may last for months ; and, finally, as happens in a few cases, it may point and discharge externally, or the patient may die from exhaustion, unless the chest be tapped, and the fluid removed. *Fifth.* The absorption may commence, in which case the sound on percussion becomes clearer, the sonorousness beginning at the top and gradually extending to the base of the chest. The respiratory murmur likewise re-appears, at first at the summit, and it becomes more manifest towards the bottom of the thorax, as the absorption goes on. The hæmophony soon reappears (54) at the lower edges of the pectoral muscle or scapulæ ; the ribs begin to move and to contract, and the coarse rubbing sound is renewed (77). *Sixth.* The absorption is complete ; the sound on percussion and the respiratory murmur, however, remain for months, if not for years, diminished throughout the whole lung ; the rubbing sound may continue for some time, and be perceptible to the patient a long while after it has become imperceptible to the auscultator. The side contracts, the scapula and arm fall towards the vertebræ, and the shoulder is depressed (138, 142).

Fig. 32.

142. The accompanying *Fig. 32* shows the appearance of a patient after recovery from severe pleurisy of the right side. The right shoulder and elbow are lower than the left; and the whole of that side of the chest is contracted. This causes the scapula of the side to fall backward towards the vertebræ and downwards: so that its angle is lower than that of the other. It is likewise nearer the vertebræ, so that the arm, in walking, moves with less ease than usual (138).

142 *a*. The physical signs of emphysema and of hydrothorax will be similar to those of common pleurisy, at least so far as they relate to dullness on percussion, hægophony, enlargement of the affected side. The rubbing sound will be less likely to appear in cases of hydrothorax than in those where mere inflammation of the membranes exists.

PHYSICAL SIGNS OF PHTHISIS.

INCE tubercles are developed in adults at the apex of the lung (*Fig. 20, Div. 1*), and at the upper parts of Divisions 2, 7, 8 (*Fig. 20, 21*), we must look in these places, and not in the lower parts, 10, for the first signs of phthisis (37, 117).

144. As pleuritic adhesions are not uncommon over a spot of the lung containing tubercles, we usually find a contraction of the soft parts behind and below the clavicles; causing thereby an apparent prominence of the clavicles (9).

145. Hence; if, on *inspection*, we perceive a depression about one clavicle, that is not seen about the other, we have an indication of some importance (9).

N. B. To enable us to judge fairly on this point, the patient should be perfectly erect (1, and *Fig. 1*).

146. *Dullness* on percussion (93) in the post-clavicular space, or at the tops of the shoulder, is another very important sign. It may exist in one of the former, or in one of the latter places; sometimes it is observed in both. Should it be in *either*, if the *rational* signs of phthisis exist, we may be justly led to suspect a small deposit of tubercles. The same

remark generally holds good with reference to a simple *difference of note or of pitch* (99). If connected with *any* change in the respiratory murmur, or resonance of the voice, this change of resonance becomes of still greater importance.

147. As the number of tubercles increases, the diminution of the sound on percussion becomes lower ; and may, at last, occupy the whole of one lobe, which perhaps becomes distinctly flat.

148. In certain cases, there is an *augmentation* of the natural sounds on percussion (96), even when there are many tubercles. This may occur where there are merely crude tubercles ; and it is then owing, I am disposed to think, to the fact, that the vesicles around these tubercles are very much dilated ; a fact which is of no uncommon occurrence. The same may occur when there is a softening of the tubercles, and consequently an admission of more air ; and, finally, it may become very manifest over a large cavity ; and co-exist with that sound, named the *cracked-pot sound* (*bruit de pot fêlé*, Fr.) (100).

149. The *respiratory murmur* alters. The earliest sound, but one which is of rare occurrence, is the pulmonary crumpling sound (79). It indicates the deposit of a very small number of tubercles. A much more common and equally significant change is a want of *expansiveness* in the inspiratory effort. You will feel the chest expanding under your ear, during the act of inspiration, but the inspiratory murmur will be shorter and less full than over the corres-

ponding part of the other lung. This deviation from the healthy standard of the sound may be very slight, and imperceptible except to the closest observation; but at times it is so great as almost wholly to obscure the sound of inspiration, and in this case the expiration is likewise altered. It is generally diminished, but it may be prolonged and blowing (46). The inspiration may become jerking, so that the air will seem to force itself into the structure of the organ by jerks (45), as if it had to overcome obstacles before it could enter.

150. ¶ Hence either of these alterations, or, in fact, any difference between the *sounds* of the respiration, as heard in the two apices, becomes a very significant sign (80). A natural exception to this has been mentioned in (38).

151. As the tubercles augment in number and size, the differences above-mentioned increase, and we may get a *rude* respiration (43), indicating a partial solidification of the lung, but not enough to produce bronchial respiration (41), or to destroy wholly the vesicular murmur (24).

152. In this stage, the voice, which previously has not been altered materially, may become more resonant. I have seen cases where it was diminished in resonance (56); and I consider this as important a sign as the increase of it; for it indicates a want of homogeneousness in the lung, owing to the fact that groups of tubercles are intermixed with the healthy lung. Not unfrequently, in phthisical cases, I have

been able to hear bronchial respiration while the patient was speaking, whereas it was imperceptible during the simple respiratory act (46 *a*).

153. When the lung is in this condition, if you cause the patient to cough, you will hear, at times, a single click or a single sonorous r  le or whistle of the most delicate and distant character. Either of these sounds, heard ever so slightly, just below the clavicle, or at the top of the shoulder (while in the remainder of the lung is heard healthy respiratory murmur), may be considered as a very unfavorable sign (65). If combined with any change in the inspiration or expiration, they become still more momentous.

154. If with the above signs there be a change on percussion; especially, if united with the rational symptoms of phthisis even the most trivial, you may be almost certain that many tubercles have been developed.

155. In two cases of undoubted phthisis, and in neither of whom was there copious h  moptysis, I heard, for many weeks in succession, a very fine crepitus (70). When I first heard it, I supposed the case one of acute pneumonia, and used remedies for that disease; but the r  le continued unchanged for weeks, and, finally, a tubercular cavity was formed. I have no doubt, therefore, that a tubercular deposit may, at times, cause as minute and as copious an explosion of crepitation as the most acute pneumonia. Dr. Fisher informs me that he observed the same

phenomenon, while auscultating a patient, and who a few moments afterwards was seized with copious hæmoptysis.

156. When one or several tubercles soften and open into the bronchi, you will hear, more or less distinctly, a crackling, mucous or sub-mucous râle (71, 73); generally most clearly during inspiration, or, still better, after coughing and along with respiration. This, in a chronic disease, attended with cough, and entirely confined to either Nos. 1, 2, 7, or 8 (*figs.* 17, 18), is almost pathognomonic of phthisis. Connected with crackling you may get changes in the respiratory murmur. It generally is somewhat *tubal or bronchial*, but never as distinctly so as in hepatization from pneumonia (39, 41). The percussion likewise gives more decided alterations from the normal sound.

157. As the disease still continues to advance, and as cavities form, you will hear gurgling (74), produced either by common inspiration or coughing.

158. The voice, in the earlier stages, rarely alters so much as in pneumonia, because portions of healthy lung are mixed with the tubercles, and consequently the sound is not transmitted so readily. When cavities form you will have pectoriloquy (53) divided into several kinds, according as the voice seems to resound more or less. It is, of course, more evident after expectoration than when the cavity is full of fluid. In fact, you will frequently hear gurgling (74), and perhaps metallic tinkling (66), before expectora-

tion, but afterwards cavernous or amphoric respiration (44), pectoriloquy (52), and on percussion the cracked-pot sound (100).

159. The cough is quite resonant in the later stages of phthisis, and it frequently produces signs, crackling, &c., when simple respiration will not; hence it becomes important as a sign in itself and as a cause of others (112, 121, 153, 156).

160. Mensuration and Palpation, though noticed by some writers, seem to be of little importance in comparison with other methods of examination much more striking (See Mensuration and Palpation) (16, 10).

161. Sometimes the sounds of the heart will help you, for, as they are transmitted more readily by a solidified part than by a soft yielding lung, you may infer that a part is more solid than usual by the greater transmission of sound. For example; these sounds are usually heard better under the left clavicle than under the right. If the reverse takes place, we may suspect disease of the right lung.

162. Example of chronic phthisis. As it is impossible to give any definite period at which the peculiar signs occur, I will briefly give you an idea of my method of examining any case of chronic cough, in which I *suspect* phthisis. In the first place, I spend from twenty minutes to half an hour in learning the exact condition of the patient; his previous health from early age; his hereditary tendencies; the various diseases he has been subject to

during his life ; his profession and its influences upon his health. Having learned these and considered their bearing as predisposing causes of phthisis, I endeavor to fix the exact commencement of his actual disease, and to discover whether it showed itself first by symptoms in the chest or elsewhere. After fixing these dates, I trace the different phases of the disease and the general state of all the functions up to the moment of examination. Finally ; I examine the cerebral, thoracic, and abdominal functions in their actual condition. In doing all this, I may date back the commencement of the actual disease for weeks, months, or even years. I proceed then to the physical signs. In order that we may be more definite in our views, let us suppose that a man has had cough for some months ; that he has or has not had hæmoptysis ; that he has or has not had trouble in his digestive functions. Let us suppose that he is somewhat emaciated, has lost strength, but is still able to attend to his work. Let us imagine, moreover, that occasionally he has had "rheumatic pains," as they are called, about either of his sides or shoulders. In a word ; let a man be affected with *any* rational symptoms that could be referred to tubercular disease of the lungs. I then strip the chest wholly bare, and make the patient sit or stand very erect with the hands hanging by the side (*fig. 1*). If the clavicles are prominent ; if the intercostal spaces are contracted ; if the chest is flattened in front, I *fear* phthisis (9). If I see one clavicle much

more prominent than the other, I fear still more that in the apex corresponding to the most prominent clavicle (9) I shall find tubercles; more especially do I anticipate this result, if the "rheumatic pains," mentioned above, have generally been seated in that part. To the movements, constrained or otherwise, of the parietes of the upper part of the chest, I pay but little attention, though they may at times be of service (10). I observe whether one shoulder is higher than the other; whether the ribs have fallen in behind, causing the scapula to fall towards the vertebra, and whether the nipple is depressed, all of which are the signs of old general pleurisy (9, 138). Having inspected sufficiently, I proceed to percussion. I examine, with especial care, the clavicles, in order to discover the slightest difference of sound between corresponding parts of each clavicle (4). Any degree of dullness, even the slightest *difference of note or of pitch* (99), *if confined to the upper part* of the chest, between two portions equidistant from the spine or sternum, augments my *suspicion* of the existence of tubercles. I care not whether that dullness be found on a part of the clavicle, or a spot only an inch square, at the top of the shoulder, over the scaleni muscles; if there be a decided difference, on repeated trials, my faith is, as mentioned.* If there

* It is sometimes difficult to decide whether there is any alteration in the *pitch* or *note*. Hence I am accustomed to use two or three modes of percussion (84, 85). If the results obtained by these various modes are identical, I am more certain that there is or is not a

is great dullness, for two or three inches from the top, while elsewhere percussion gives a clear sound, I am almost sure there is tubercular disease. If, on the contrary, the dullness extends all over one lung, I am doubtful if it be not the result of former pleurisy. If the dullness is at the base of the lungs, and the upper part is clear, I feel almost certain that the disease is not tuberculous; i. e. if the patient is an adult. If it be a child, there is some doubt, because tuberculous disease at times attacks the lower part of the lungs in youth, while the upper portions are healthy. Having noted *thoroughly* all these results of percussion, even in their minutest shades, I proceed to the auscultation of the respiratory murmur. My object is to examine the inspiration and expiration, to observe whether their ratio is normal (36); whether one is shorter or longer than it ought to be (46); whether the inspiration is full and expansive, corresponding in duration to the movements of the chest, or whether it is shortened, so that the parietes are felt to rise and to expand considerably under the ear before the vesicular sound is heard (149); whether there be any prolongation of the expiration (38); whether the inspiration or expiration is jerking (45), as from some obstruction to the passage of air; whether there is the slightest rôle of any kind

deviation from the normal standard of sound than if I use only one method. If, on the contrary, they differ in their results, I consider that percussion will afford less assistance towards the diagnosis of the case than it does on many occasions.

connected with either ; and, if there be, whether it is limited to the upper parts of the chest. If any of these conditions occur, and the results of auscultation and percussion agree, even in the slightest degree, my *suspensions* are *confirmed*. For example ; let us take the most simple case. Suppose I find a difference of note : the right lung, at its apex, resounding less distinctly than the left ; if, in the same spot, I find the inspiration shortened, in a case where the rational signs point to phthisis, I feel certain of the existence of tubercles. If, however, the rational signs do not indicate the existence of phthisis, I shall have doubts about the diagnosis ; but I shall have, nevertheless, very great fears that there are a few tubercles deposited near the part. But, suppose I find absolute dullness and evident crackling ; then I am sure of tubercles being there in a softened state ; the forerunners of a cavity with gurgling and pectoriloquy.

In these examinations, I auscult during the common measured breathing which the patient is accustomed to. Having thus examined the whole chest, I try the effect of long breaths, at stated intervals, upon all parts that I have previously examined. Thus, I frequently am able to find some of the differences in the murmur, or some of the rôles, mentioned above, when nothing marked can be discovered in common breathing. In making this part of the examination I am careful that the sound from the mouth, simulating bronchial respiration, is not transmitted. Many gross

errors arise from neglect on this point, even when the patient is breathing quietly. Having tried long inspirations I direct the patient to cough and immediately to make a deep inspiration, and I listen to that and the râles which it sometimes produces (159). Through these remarks I have supposed that I am examining a doubtful early case of phthisis. But the rational signs may be very manifest; hæmoptysis, hectic fever, emaciation, &c., being present. I may then obtain greater differences on percussion; or if there is not any manifest difference on percussion, owing to the equal development of the disease in both lungs, I may still decide unfavorably for my patient, for, very likely, the respiration may have become *rude*, or coarse (43), which indicates there is under the ear much more of tubercular disease than of healthy lung. In others I may find that the lung is greatly solidified, causing an absence or great diminution of the respiratory murmur (28); or, possibly, a distinct bronchial or tubular sound may be heard, indicating a small cavity, with possibly condensation about it (41). Finally, I may hear a cavernous sound (42), which becomes to me an indication of a large excavation with thin parietes. Connected with these variations in the murmur, are the râles I frequently hear. For example. A slight sibilant or sonorous râle, or a single click (65), is often heard in the *rude* respiration (43); and it is then indicative of condensation without excavation; a crackling (73) with the simple tubular (39 to 41) indicates softened tubercles,

and finally gurgling (74), with the tracheal or cavernous (42), indicates large ulceration. I remember that frequently these râles are produced only by a full breath, or a cough. Hence therefore I always desire the patient to cough, and afterwards draw a deep breath. In addition to the production of râles, the cough is useful in itself as a means of testing the resonance; I therefore notice the amount of its *resonance* in the same manner as I notice that of the voice.

If, in *any* phthisical case, I find marked resonance of the voice or any manifest difference between the two apices, except, perhaps, a little more resonance at the top of the right than of the left (38, *fig. 22*), my prognosis is very unfavorable, for a very general condensation by tubercles is indicated, or what is more common, a cavity, either larger or smaller, in that portion of the lung then under examination (57).

The *time* at which we should make an examination is not an unimportant consideration; for, at times, a râle of a slight character may be heard under the clavicles, at one hour of the day, which is wholly absent or is very faintly perceptible at other periods (see 1).

ACUTE PHTHISIS, AND PHTHISIS IN CHILDREN.

162 *a*. The physical signs of these diseases are very inferior to the rational signs. In fact acute phthisis has none that can be called peculiar to the disease, or in the least characteristic of it. A certain breathlessness while speaking is one of its most

marked signs, and if in an acute disease that has no distinct physical signs, we find this breathlessness combined with an obscure, but intense febrile action, we may be almost sure of the correctness of our diagnosis of the case as one of acute phthisis. Phthisis in children rarely presents the same manifest and regularly ordered signs that are found in adults; and for the diagnosis we must depend chiefly on the rational signs.

PHYSICAL SIGNS OF PNEUMOTHORAX.

PNEUMOTHORAX causes a sudden enlargement, immobility, either partial or general, and a permanent distension of the walls of that side of the chest which is diseased.

164. There is either an entire absence of the respiratory murmur, or it is very feeble; if there is a free communication with the bronchial tubes, there may be amphoric (44) respiration; a metallic echo (67); if a little fluid be mingled with the air there may be a metallic tinkling (66), produced either by inspiration, or by shaking the patient, or by the act of swallowing.

165. The voice is, usually, not much modified; but sometimes, when there is a very clear amphoric respiration, you will hear an increased resonance; and in this case there is generally a diminution of the vibration of the parietes of the chest (37, 14).

166. Finally, there is a great resonance on percussion, tympanitis of the diseased side, especially in the earliest period of the disease. I have, however, met with cases in which, had I depended entirely on the resonance on percussion, or, in fact, upon any of the physical signs, I might have been deceived.

167. The surrounding organs, the liver, heart, spleen, stomach, &c., are pressed out of place by the quantity of air distending the pleura.

168. **EXAMPLE.** The most common cause of pneumothorax is a rupture of a portion of the lung into the pleural cavity, from the bursting of a tubercle, or of a small gangrenous eschar on the surface of the lung. In either case the cavity becomes filled with air. Great orthopnœa, cold sweats, almost total loss of voice, usually severe pain in the side, great prostration, and lividity of lips ensue ; signs, proving that a large portion of a lung has been suddenly prevented from the performance of its functions, from their sudden appearance, of themselves almost sufficient grounds of diagnosis. The permanent distension (10), and the augmentation of the resonance (96) on percussion, are always present ; the metallic tinkling (66) is most usually heard ; amphoric respiration (44) rarely, unless a large aperture communicates between the bronchi and pleura. Phthisis most frequently produces this ; but gangrene of the lung has at times occasioned it. The other causes of pneumothorax are of a more chronic nature, and have similar though less severe symptoms. I met with a case last winter which was wholly latent, until auscultation and percussion revealed its existence. Similar cases have been seen by others.

PHYSICAL SIGNS OF GANGRENE OF THE LUNG.



BEFORE the disease reaches the surface of the lung, and physical signs appear, you may suspect its existence from the fœtid sputa; but if the disease is extensive, and reaches the surface of the lung, you will have, in the earlier stages, a total flatness (101); and if deep seated, with healthy lung above it, you may obtain merely a slight difference of note or pitch (99) between the diseased and healthy parts. When a cavity forms, you may, if it be superficial, get the cracked-pot sound (100).

170. The respiratory murmur is lessened, or roughened, and as a cavity forms, you will obtain cavernous respiration (42), which, however, is apt to appear distant, and sometimes it is heard only during the act of coughing.

171. There are various irregular crackling râles heard during the disease (68). As soon as the parts begin to soften, the common mucus presents itself (71); when a cavity appears, gurgling (74) is heard with the cavernous respiration (42).

172. The voice is altered. Its resonance is either augmented (57) or diminished (56) before the abscess forms; it becomes pectoriloqual (52) afterwards;

but this gradually subsides after months of convalescence.

173. N. B. The physical signs are not nearly so diagnostic as the rational.

174. EXAMPLE. A man is seized with cough, perhaps without expectoration, or if there be any it is not peculiar until after a time varying from a week to several months. It then becomes somewhat offensive to the smell, and very nauseous to the taste. The quantity augments and it becomes dark, more fluid, and very offensive, so that sometimes the apartment and possibly the whole house is scented with it. This state of things may come on suddenly from a sudden communication of the gangrenous mass with the bronchi, or be slowly superinduced, but the gangrenous odor is the only certain sign of gangrene. Usually in such a case you will get marked dullness on percussion (101). This may exist for some length of time with an obscurity in the respiratory murmur. At length, perhaps, after the lapse of several weeks, crackling, gurgling (68), supervene, with cavernous respiration (42), and great resonance of the voice (52). As the patient recovers, the râles diminish, and finally are heard only on coughing, or deep breathing; the resonance of the voice subsides; the respiratory murmur gradually comes again, but very slowly; and a deep seated cavernous sound, or r  le, is frequently brought out by a full breath in a spot where on quiet breath the respiration seems only slightly less than it is in the other lung. A year or eighteen months is a

moderate time for a person to recover in, after having had a large portion of the lung slough, as occurs not unfrequently in cases of gangrene. Sometimes these cases have been mistaken for phthisis. Of course, the *spot* in which the diseased sounds are heard, may possibly assist you in your diagnosis, for if you find the chief signs towards the middle or base of the lung, you will be almost sure that it is not a case of phthisis (143). Should the signs occur at the top, the diagnosis will be more difficult, and the rational signs must be your guide. In a case that I once saw, the percussion alone, giving a very flat sound, made us *suspect* gangrene.

PHYSICAL SIGNS OF EMPHYSEMA OF LUNG AND OF ASTHMA.



MANIFEST *enlargement* in the intercostal spaces. As phthisis causes depression behind the clavicles, so emphysema produces a fullness in the same part (8, 144).

176. The parietes of the chest move with much effort, as if from permanent distension, during the respiratory act (10).

177. On *percussion* there is an extraordinary resonance of the chest (97). This sign is quite manifest in some old asthmatic patients. But since so much resonance is, at times, heard in early cases of phthisis, you must be cautious of laying too much stress upon it, as a pathognomonic of emphysema.

178. The respiratory murmur is usually diminished very much; and at times it is wholly wanting (28). At times the expiration is much longer than natural, and it becomes, as it were, a constant, slight, sibilant râle.

179. The resonance of the voice is either as in health, or it is diminished (56).

180. The sibilant râle is frequent (62), and is some-

times mistaken for the respiratory murmur. During a severe attack of asthma (which this disease gives rise to) you will have all the sounds above described, viz. sonorous (62), mucous (72), sub-crepitous, &c. (73). They are usually heard in all parts of the chest.

181. The sounds of the heart are transmitted less clearly.

182. EXAMPLE. This disease, in its severity is found almost exclusively among old asthmatics. In fact, emphysema and asthma, according to some writers, are cause and effect. The patient rarely shows any physical signs of importance, except during an acute attack of bronchitis, to which emphysematous people are peculiarly liable. Soon after such an attack you will find him wheezing, with a dry cough, and difficult expectoration. On inspection, you will perceive that although there is labor in breathing there is not much motion of the parietes of the chest (10); the muscles of the neck, however, are strained and often hypertrophied. On applying your ear to the chest, the wheezing or sibilant râle becomes still more manifest, perhaps obscuring the natural respiration; occasionally the sonorous râle is heard (62). This state of things continues, perhaps, for a week or more, unless remedies of an expectorant nature are used; under the influence of which a secretion of mucus takes place, the crackling râles (68) come on all over the chest, and some relief is obtained from the severe dyspnœa, &c. If no relapse

takes place, the patient recovers from the acute attack in a week or fortnight longer. But the habitual liability to dyspnœa remains, with a rounded swollen aspect of the chest (8), and increased resonance on percussion (96), and somewhat diminished respiration.

PHYSICAL SIGNS OF PULMONARY APOPLEXY.



DISEASE of the lung, commonly called since the times of Laennec pulmonary *apoplexy*, is a very rare disease. When severe, it causes dullness on *percussion*.

184. Absence or roughness of the respiratory murmur in the part (28).

185. Crackling around the edges of the diseased part (68).

186. A slight alteration in the resonance of the voice, when compared with the sound in the healthy lung (80).

187. EXAMPLE. Hæmoptysis happening in a case, which you are satisfied is not tuberculous, is the only sure sign of apoplexy of the lungs. The physical signs will give you the extent of the disease. As an idiopathic disease it is one of the rarest with which we meet.

PHYSICAL SIGNS OF DILATED BRONCHI.

By dilatation of the bronchi, the voice becomes more resonant (51, 52), and even pectoriloquy is caused, if one tube be very much enlarged.

189. A bronchial (41), or perhaps cavernous respiration is heard (42).

190. A constant mucous râle for some months, always heard in one particular spot at the base and posterior part of a lung, in a person not very ill, is sufficient to make one suspect the disease (76).

191. The sound on percussion is not materially altered ; if at all altered, it is usually slightly diminished (98).

192. **EXAMPLE.** A youth walked into my room and said he had been quite well until five minutes previously, when he had hæmoptysis. On inquiry, I found that in early life he had had severe pulmonary symptoms, but that since he had usually been in good health, though liable at times to a cough. As the hæmoptysis was slight, I expected to find few physical signs, if any. I was surprised to find that he had cavernous (42) and bronchial (41) respiration with pectoriloquy (52) and bronchophony (51

throughout the whole of the left lung. This side had a contraction as from old pleurisy (142). I inferred that these signs of the respiration and voice were of a chronic nature, and not at all connected with his acute attack. Otherwise, I should have been obliged to suppose hepatization and cavities to have come on in the young man without previous sign. The contraction of the chest confirmed my suspicions. My explanation was, that in former times, when younger, the lung had been compressed, and upon recovery from the pleurisy, the pulmonary parenchyma not being able to expand itself, owing to firm lymph over and in it, the bronchi had yielded to the pressure of the external atmosphere, and had become dilated in proportion to the absorption of the fluid in the pleura. Three months afterwards the young man died of tubercles developed in the other lung, and the bronchi, enormously dilated, filled up the major part of the lung over which we had heard the tubular sounds, &c.

193. Dilated bronchi may deceive you, and lead you to think that the case is one of phthisis. I should have been deceived, had I not examined the man above-mentioned within five minutes after the hæmoptysis occurred. If I had seen him a week or fortnight afterwards, I might have imagined a condensed lung, or even that cavities had been formed. There is no sure defence against this error. You must examine accurately all the rational symptoms, and compare them very carefully with the physical,

and you will usually be able to decide correctly. However, a dilatation such as the above very rarely occurs. I have never met with another case. In making up your mind you must have reference to the spot in which the râles are heard. If heard in the lower portions of the lungs, where they are usually heard in dilatation of the bronchi, you will of course have less fear of phthisis (162). If at the apex, the physical signs may absolutely deceive instead of helping you (162, 80, 81).

PHYSICAL SIGNS OF ŒDEMA OF THE LUNG.



ARELY do cases of œdema of the lung produce any change of sound on percussion, or, if it be at all altered, it is but slightly diminished. At times there is merely a change of note or of pitch.

195. The vesicular respiration is usually obscured by a minute crackling (70), heard in 10 (*Fig. 18*) most distinctly, because that is the posterior and lower part of the organ.

196. The resonance of the voice is normal.

197. EXAMPLE. Pulmonary œdema, as an *idiopathic* disease, I have never seen, and do not believe in its existence. It is usually a consequence of some malady that causes dropsical effusions elsewhere: such as a disease of the heart, tumors, &c. You will generally hear a minute crackling (70), such as is observed in pneumonia, though usually it is louder, with bubbles that seem larger, and more moist (subcrepitous) (73). These signs may last an indefinite period of time; they may also cease under remedies producing absorption, and subsequently reappear.

COUGHS HAVING NO PHYSICAL SIGNS.

THESE cases are different from bronchitis or phthisis, without signs (105). But they have often made me anxious about a patient, because I have feared the existence of phthisis. I have no doubt they will trouble you. I have commonly met this symptom in females below the middle age. The throat has usually been complained of, and on examination the fauces have appeared red. The cough has been loud and "*barking*." Warm weather, or a change of air, has commonly relieved it, but it has always been most inveterate and intractable under the use of remedies. It has been connected with no other severe symptom. There is still another class of patients; viz. the distinctly nervous. In one of these cases, I have known aphonia and a most violent cough to last for months, and then suddenly disappear.

199. The diagnosis in these two classes of cases is sometimes difficult. Yet if you are accurate in the investigation of the rational and physical signs; above all, if you have accustomed yourselves to frequent auscultation of the sounds heard over different parts

of the healthy chest (49 *a*), you will generally be able to decide. In the former class, the fact that the cough exists as a *single* symptom, or with nothing connected with it save some wandering pains about the chest, after a fit of coughing; and in the latter category, the nervous, hysterical character of the patient, and the absence of all physical signs about the lungs in both, are generally sufficient indications for an accurate diagnosis.

PHYSICAL SIGNS

RELATING TO THE

CIRCULATORY ORGANS.

CIRCULATORY ORGANS.



ALMOST all the physical signs are far less to be relied on in diseases of the heart than in those of the lungs. If you keep this remark in mind while reading the following rules, and carry it into your subsequent practice, you will be prevented from making many a hasty and erroneous diagnosis.

201. The rules in regard to the position, &c., of the patient (1), apply to the examination of cardiac diseases, as well as to that of pulmonary complaints.

202. If the examination is made with the patient in a sitting posture, the heart falls downward about an inch lower than it is when he is lying on the back; it is also tilted forward. Hence arise differences on percussion, auscultation, &c., the signs being lower in the erect than in the horizontal posture. There will likewise be greater dullness on percussion in the erect than in the horizontal position.

203. In examining the heart, *mediate* is usually better than *immediate* auscultation (18), for with the stethoscope you can examine small spots, without being confused by the sounds from the adjacent parts. This localization of sounds, as we shall see, is of much greater moment in auscultation of the heart than in an examination of the lungs. Dr. Pennock very strongly recommends the flexible stethoscope. I have never found it necessary (22). In our examination of the circulatory organs we make use of *inspection*, *palpation*, *mensuration*, *auscultation*, *percussion*, and finally, if need be, *auscultatory percussion*.

INSPECTION.

INSPECTION commonly shows a very slight motion of the heart, that is perceptible about the sixth rib ; but in a case of hypertrophy, or of dilatation of the heart, or of aneurism (10), the pulsation may become much more manifest. The neck also should be observed, because various diseases of the heart produce a great pulsation of the carotids (275), or of the jugular veins, in which there is usually, while a person is in good health, but little if any motion manifest to the sight (10). At times, though rarely, a tumor forms either in the back or front, in consequence of an aneurism pressing through the ribs (344). In pericarditis, with effusion, there is prominence of the left breast, and the left nipple is somewhat raised (262). In hypertrophy the apex strikes a little outside and higher up than the spot in which it usually appears (275). Sometimes, a tumor may form over a great vessel and cause a pulsation to be perceptible. In such case, nice diagnostic powers will sometimes be needed.

PALPATION.




PALPATION should be attended to in all diseases of the heart.

205. In health, there is little or no impulse felt when the *fingers* are placed over the apex of the heart, between the fifth and sixth ribs on the left breast. In diseases, hypertrophy (275) and dilatation (277), especially the former, you may get a very strong impulse, even through the clothing. It may, moreover, be observable over a much larger space, even over the whole of the left breast (275). In pericarditis with effusion of fluid, no impulse is felt (260). It is very feeble in some fevers of a low type (215). It is at times intermitting in various diseases. In some old persons it is always so even when they are in apparent health. Great irregularity in an acute or chronic disease is always a bad sign. Aneurism of the aorta may cause a pulsation through the sternum about the second or third rib (336). Or we may find it behind the clavicle in aneurism of the subclavian (347), and near the lower part of the back in disease of the descending aorta (346).

206. Palpation gives the peculiar thrill called *frémissement cataire*. It is so called because it produces,

to the end of the finger gently applied to a part, a sensation similar to that felt on the chest of a cat that is purring. It is most distinctly perceived over some aneurisms of the arch of the aorta. It may, however, be felt in various valvular diseases of the heart. It usually indicates serious obstruction of the blood in its passage through the heart ; as it may be excited, temporarily at least, in nervous persons by agitation of mind, you should be careful of inferring the existence of serious lesion, unless some other signs be present.

MENSURATION.

OME use mensuration, but in comparison with inspection, auscultation, and percussion, it is rarely of much use in diseases of the heart (19, 17). An instrument named cyrtometer has, however, been recently invented by a French writer, to mark more accurately than can be done with the eye, the various prominences over a heart that is diseased. It seems to me that it would be of little real practical value.*

* Manuel de diagnostic des maladies du cœur, &c., par le Dr. F. Andry.

AUSCULTATION OF THE HEART.



DELICATE changes in the sounds and impulse of the heart are the chief elements in cardiac auscultation.

209. The sounds are either *natural, diminished, augmented, absent, increased in number, irregular, changed into or accompanied by abnormal characteristics.*

210. The *natural* sounds are two ; the first is dull, rather longer than the second, and is heard most distinctly below the left nipple, about the fifth rib ; the second is sharp and quick, and most evident about the median line and between the second and third ribs.* The *first* sound depends upon many conditions, the most important of which is the muscular contraction of the ventricles. But besides this are the motion of the mitral and tricuspid valves, the impulse of the heart against the walls of the chest, the contraction of the auricles, and the rush of the blood from the ventricles, all having an influence. The se-

* Dr. Williams represents them by the words "Lubb tup." I should prefer "Lubb tuk." Pronounce these and apply your ear to a healthy heart, and you will understand this description.

cond is owing to the regurgitation of the blood in the aorta and pulmonary artery against the semilunar valves of those vessels.

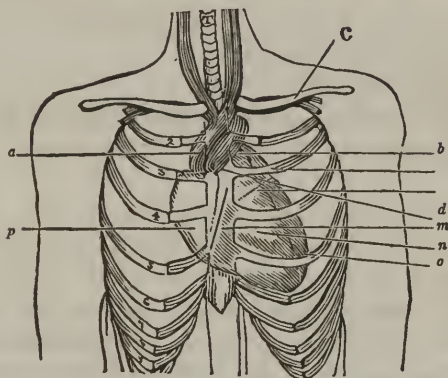
211. In health the sounds take place in *regular order*. From the commencement of the first sound to its return, a little less than a second of time is occupied. Of this, one half is occupied by the first sound, the next quarter by the second, and the last quarter by a period of almost entire rest. Dr. Pennock states that the sounds over the right cavities are of a "more clear flapping" character than those over the left.

212. The sounds are of course heard most distinctly over the spots where they originate. Thence they radiate, being generally heard less distinctly over the right breast than over the left. On the back, they are perceived somewhat along the course of the aorta, at the left of the vertebral column, and generally more clearly throughout the left than the right back. At the top of the right back they are scarcely perceptible. We may add that the second sounds, whether healthy or diseased, are transmitted along the aorta and pulmonary artery more readily than elsewhere.

213. The following diagram, taken from a larger drawing, made under the direction of Dr. Pennock of Philadelphia, will serve to show the position of the heart, and of its valves with reference to the sternum and the ribs, during life, and when fully distended. It will be well to study this diagram carefully, in order to get a definite idea of the va-

rious parts in which we should auscult, in order to hear most clearly the sounds from the different valves.

Fig. 33.



a Vena cava descendens.

b Pulmonary artery valves, lying midway between the second and third ribs, half an inch from the left edge of the sternum.

c Left auricle, only a small portion of it visible above the third rib.

d Aortic valves, lying under the median line of the sternum, and on a level with the lower edge of the third rib.

e Mitral valve, represented by . . lying between the point of union of the third rib with its cartilage, and the upper edge of the junction of the fourth cartilage with the sternum.

m Tricuspid valve, represented by —; extending under the sternum from a little below the level of the third rib of the left side, to the lower edge of the fifth rib of the right side.

n Right ventricle.

o Left ventricle, almost concealed by the right.

p Right auricle, distended and fully seen.

214. The following diagram, drawn from the descriptions by Drs. Hope and Pennock of the actual motions of the heart, shows the *times* at which the different sounds are made and the impulse occurs; their relation to the periods of systole, diastole, and rest; the relation of the systole, diastole, and rest to each other, and to the impulse felt externally. The *converging straight* lines indicate *active contraction*; the *diverging* indicate *active dilatation*; the *parallels* point out a *state of rest*; the *waving, converging, and diverging* lines indicate *collapse and passive dilatation*. Supposing the pulse to be at sixty per minute, one half a second will be occupied by the ventricular systole, and this causes the impulse; one quarter of a second will be occupied by the diastole, and the same time by the state of rest.

Fig. 34.

Systole. First Sound. Impulse.	VENTRICLES	AURICLES	Active Diastole.
Diastole. 2d sound.			Collapse from blood falling into ventricle.
Rest.			Dilatation with ve- nous blood.
Dilatation.			Contraction.

INFERENCES FROM THE ABOVE.

214 *a. First.* While the ventricles are contracting, the auricles are actively dilating.

214 *b. Second.* While the ventricles are actively dilating, the auricles collapse, and allow their blood to flow into the ventricles, during about two thirds of the period of the diastole, when the veins begin again to fill the auricles.

214 *c. Third.* During the period of ventricular rest, the auricles are gradually distending, until, finally, becoming swollen to their utmost, they contract with a sudden jerk. This throws a little more blood into the ventricles, previously nearly filled by the blood that had fallen into them from the auricles, and they are again stimulated to active systole.

THE SOUNDS OF THE HEART.

215. They are *diminished* in cases of debility, when the *heart is soft or flaccid* (205), as in fevers; also, in some cases of hypertrophy (275), when the heart moves with difficulty, as from congestion; also, in pericarditis with effusion (260). Simple diminution of the sound is not, however, sufficient to enable us to decide as to the existence of disease, or upon the nature of it.

216. They are *augmented* after exercise, in inflammatory excitements of the system by mental emotion, &c.; in some nervous patients they are sometimes heard at a distance of two or three feet from the patient (Andral). A loud sound was formerly considered an evidence of dilatation of the heart, but now it is of itself considered to mean nothing (277).

217. I have known an individual, a chlorotic patient, in whom the first sound was frequently wholly *absent* for a time, and returned only after some hours. This patient was able to work, and had no very evident signs of organic disease. The absence of sound was probably owing to the sluggish contractions of the ventricles.

218. The sounds are sometimes *three, and even four in number*, owing probably to a want of harmony between the two sides of the heart; for of course there must be four sounds; but similar parts contracting at the same moment only two are heard; or perhaps it is owing to unequal repetitions of the ven-

tricular contractions. Bouillaud says, that this change in the number of sounds heard is indicative of serious disease either of the heart or pericardium.

219. *Irregularity* of the sounds and motions of the heart may exist without organic disease. By itself, therefore, especially if not permanent, it is of little importance, but it becomes a more serious symptom when combined with other signs; such as increased dullness on percussion, and the various types of bellows murmur, &c. (223) Many old persons have this irregularity as a constant symptom, while in health; and, what seems at first sight very peculiar, they have regular pulsations only when affected with some acute disease.

ABNORMAL SOUNDS OF THE HEART.

220. Among the abnormal sounds none is so striking as the *bellows murmur*. It may be present without serious organic disease. For example: it is heard at times in patients enfeebled by any cause; it is very frequent in chlorosis and after severe hæmorrhage. It may be caused in peculiar constitutions by any over-exertion by which the respiration is accelerated, such as running, going up stairs, coitus, &c. In general, it may be said to be produced *at times* by any functional or organic change which, without absolutely causing disease of the heart, may yet obstruct its motions. It has been noticed of late years in Europe and America in certain early cases

of phthisis. In these cases, it is usually most distinct under the clavicle (315).

221. What I have stated above applies *almost* exclusively to the mildest form of the bellows murmur.

222. There are several degrees to this sound, which, though called by different names, I prefer, as they may run into each other and may all be caused by the same disease, to consider as one sound, varying in its greater or less degree of harshness.

223. In its mildest form, it is slight, short and breezy, the slightest *prolongation of either sound* of the heart (*bruit de souffle, Fr.*) (311). Then comes the pure *bellows sound*, its name sufficiently indicating its characteristics (*bruit de soufflet, Fr.*) (296). Then the *filings sound* (*bruit de rape, Fr.*) also indicating its nature by its appellation ; it is the first that gives decided roughness. Finally, we hear the loudest and roughest of the whole, viz. the *sawing sound* (*bruit de scie, Fr.*) (289). The last two rarely exist as constant symptoms, unless they are caused by some organic disease of the heart (297, 315).

224. All these sounds have occasionally a musical note, resembling the cry of a young bird, and are sometimes heard some inches from the chest.

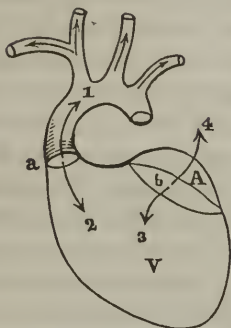
225. The causes of this sound are, according to Andral, 1st, any difficulty in the passage of the blood through one of the orifices ; 2d, a reflux of the same through the orifices ; 3d, some modification in the play of the valves ; 4th, some unnatural contraction

of the muscular fibres of the heart ; 5th, increase of its impulse ; 6th, some tumor compressing it ; 7th, obstruction by adhesion of the two layers of the pericardium ; 8th, chlorosis, &c., various diseases of the system. I will add to the above, that I have met it under the clavicle in some early cases of phthisis. Dr. Graves has heard it in pneumonia. I presume these cases may, however, be referred to the first cause mentioned by Andral. A most formidable number of causes truly for a young auscultator to decipher ! Be of good courage ! The mystery will, generally, be easily unravelled if you truly study a case ; or, if it is not, you will not be worse off than your elders (312 to 315).

226. These sounds, when constant, *usually* indicate a disease of the valves of the heart of such a character as to cause a disturbance in the current of the blood ; and as such diseases may either *obstruct the current* or *allow of its regurgitation*, it becomes necessary to study the morbid sounds arising therefrom with reference not only, 1st, to the spots where they are heard, but, 2d, to the time at which they occur ; whether before, during, or subsequent to, the action of the parts that cause the healthy sound.


227. The following diagram serves to illustrate the *places* we have been speaking of. This plate represents the outlines of an auricle and ventricle with the aorta and its branches. A. auricle, V. ventricle ; *a* aortic orifice ; *b* auriculo-ventricular orifice. The

Fig. 35.



direction of the arrows represents the currents; hence it is evident *obstruction* 1 of the aortic orifice would be heard more up the aorta than in the ventricle (297), while an *insufficiency* of it and consequently *regurgitation* 2 would be slighter and rather more distinctly down in the ventricle, though by no means

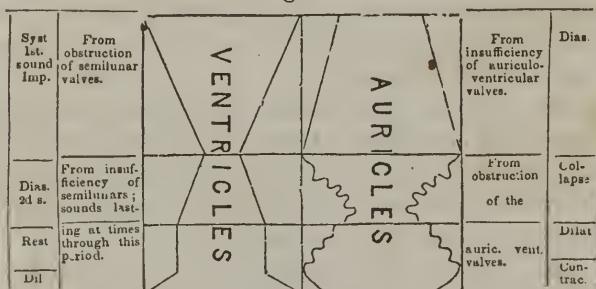
absent along the course of the aorta (302). *Obstruction* 3 of the mitral valve would produce a very slight sound, and it would be heard chiefly over the left ventricle as its focus, and but slightly, if at all, along the carotids (283). *Insufficiency* 4 of the same would be louder; but over the ventricle chiefly; and much less distinct, or, perhaps, absent along the carotids (289). Similar statements might be made in regard to the tricuspid valves and those of the pulmonary artery (294, 296, 307, 309).

227 a  N. B. All these remarks must be taken with limitations; for, in actual life, we can rarely analyse the sounds so clearly. I have seen a case in the hospital at Boston, in which there was a strong bellows murmur for some time, but no disease of the valves was found at the autopsy; simple hypertrophy of the heart and obstruction of the blood in the lungs, were the marked conditions. But the most remark-

able case, as a *caution*, is that given by Dr. Graves,* in which there was disease of the aorta with bellows murmur over the *ventricles*, and *none over the aorta*. Nevertheless, for definiteness of *purpose*, as an auscultator, it will be well to *study* the diagram and the remarks thereupon.

228. The following diagram is intended to present an idea of the *times*, at which these sounds occur with reference to the sounds, impulse, and various movements of the healthy heart. It is, in fact, the same as *fig. 33* (214), and represents exactly what that did, but, in addition, gives the times of the *morbid valvular murmurs*.

Fig. 36.



228 *a*. From this diagram we perceive, *first*, that morbid murmurs, from *obstruction* of the semilunar valves, occur during the ventricular systole, and near the time of the impulse of the heart; that murmurs

* Clinical Medicine, page 922, Dublin, 1843.

from *insufficiency* of the same valves immediately succeed the systole and impulse, and that, if the disease is severe, the sounds may continue until the next systole, thus causing a continuous bellows sound :

229. *Second.* That murmurs, from *obstruction* of the semilunar valves of the aorta and of the pulmonary artery, occur at the *same time* with murmurs from *insufficiency* of the mitral and tricuspid valves. How then are we to decide between them ? By observing the *places* at which the healthy sounds are most distinct (*fig. 33*), those spots being the *foci* of the morbid sounds ; and, moreover, by remembering that the aortic sounds and those of the pulmonary artery are, generally speaking, transmitted up through their respective canals (*fig. 35*) (227), whereas the auriculo-ventricular murmurs are chiefly limited to the ventricles (290, 297) :

230. *Third.* That sounds, arising from *obstruction* of the semilunar valves, or *insufficiency* of the *auriculo-ventricular valves*, will generally be louder than others, because produced by the strong contractions of the muscular ventricles :

231. *Fourth.* That *insufficiency* of valves, particularly of the semilunar valves of the aorta, may cause a sound to be continued not merely through the diastole, but also through the ventricle's period of rest :

232. *Fifth.* That from the slight spaces of time left for the feeble contractions of the thin auricles, only a slight murmur can be produced, even where

there is considerable disease of the valves. This actually occurs, and all morbid sounds are sometimes imperceptible, even when there is a very great *obstruction* of the auriculo-ventricular orifices :

233. *Sixth.* That a murmur from *obstruction* of the auriculo-ventricular valves may occur at the same time with the second sound, or just before the first. By some, it is said to occur most commonly at the latter time. A priori, one would be induced to think so, from the fact that there is then an active contraction of the auricle. I believe, however, it may occur at both periods :

234. *Aortic sounds from obstruction* have been said by Dr. Hope (297) to resemble the whispered “s” or “r,” and to be very superficial. *Aortic sounds, from insufficiency* of valves, resemble the word “awe” (302). Murmurs from *obstruction of auriculo-ventricular* valves resemble “who” (294) ; those from *insufficiency* of the same valves have the same tone, but are much louder, and more frequently heard (289).

235. A late French writer speaks of a *parchment-like* character to the sounds of the valves, which, though difficult of description, is very distinct to his ear, and indicates a hypertrophy and thickening of the valves ; not, however, in so great a degree as to cause any real obstruction to the passage of the blood ; and not enough to prevent them from fully performing their functions. I have never heard this sound in

a sufficiently distinct manner to enable me to be certain that thickening of the valves really existed (283).

PERICARDIAC SOUNDS.

235 *a*. In health there are none. Some appear in disease that are of very great importance in enabling us to form a correct diagnosis.

236. *Sound of new leather (bruit de cuir neuf)*. This sound is heard in the earliest* stages of pericarditis (258). It is not very common; therefore you must not be surprised if you do not hear it. It is like the creaking of new leather; and it is heard when the two layers of the pericardium are rough and stiff from inflammation. It disappears when an effusion of fluid takes place into the pericardial sack; because, of course, the two layers are then separated.

237. *Pericardial rubbing sound*, called by some writers *to and fro sound*, occurs in pericarditis (259) with effusion of lymph; or in any disease of the heart that causes a roughness of the pericardial layers. In pericarditis, it may be heard at the beginning of the disease, and may follow the leather sound; but it usually appears later in the disease, when the absorption of a quantity of liquid previously effused, allows the two layers to come in contact (263). It resembles in its characters the rubbing sound heard in pleurisy (128); and it is very superficial.

* Dr. Graves (Clinical Med., 910, Dublin, 1843) mentions a case in which a distinct musical murmur preceded the creaking sound.

It may be distinguished from pleuritic sounds by causing the patient to hold the breath, when the sound will be perceived to evidently occur during the action of the heart.* Occurring after a large effusion in pericarditis, it is, in some degree, a favorable sign; though some writers doubt whether any adhesion of the pericardium, of which this sound is the forerunner, can be otherwise than unfavorable.

238. Sometimes in case of an effusion of fluid into the pericardial cavity there is a *washing or churning sound* heard (261 *b*). It is of little importance, and rarely heard.

239. All these pericardiac sounds are said to be† more superficial, and are more subject to changes than the valvular murmurs. I think that such is the case.

THE IMPULSE OF THE HEART.

240. The other element used in auscultation of the heart is the impulse. This is usually very slight. It is synchronous with the contraction of the ventricles, and almost synchronous with the radial pulse. In

* This remark is generally true, but it is not universally applicable; for I think I have met occasionally with a case in which a rubbing sound has been produced by the heart, causing some movements of an adjacent inflamed pleura. In such cases, however, the sound is not so constantly an accompaniment of the cardiac motions, and it is more irregular in its characters. The rational and the other physical signs will usually make the diagnosis easy.

† Graves' Clinical Medicine.

health, it is scarcely perceptible, and felt in a very limited space between the fourth and sixth ribs, on the left breast (205).

241. Like the sounds of the heart, it may be *natural, diminished, absent, quickened, augmented in force, or irregular*.

242. It is *diminished* in various diseases, such as softening of the organ in fever ; pericardial effusions (260) ; usually in dilatation of the heart (277), and when an emphysematous lung projects over the heart.

243. It is sometimes *absent*, under similar, but more severe, circumstances ; for instance, pericarditis (261 *a*) with effusion, and hydro-pericardium may push the heart away so that it cannot reach the parietes.

244. It is *quickened* by emotions of the mind ; active exercise ; by all acute febrile diseases ; by great hæmorrhage ; by the approach of death, &c.

245. It is *augmented in force* by those conditions that quicken the sounds and impulse. But it is most strikingly increased by hypertrophy (275) ; and, in this case, it frequently extends over a much larger space than usual, and may be so strong as to jar the bed on which the patient lies.

246. *Irregularity* is sometimes *natural* ; that is, persons are subject to it from their earliest years, and it is not then a serious symptom. A curious circumstance in these cases is that during an attack of disease the pulse becomes usually regular. Old persons

are peculiarly liable to this irregularity. Under other circumstances, when combined with other rational and physical signs of disease, it may be of great moment as indicative of valvular disease (258, (285) 292). I think it not very uncommon to meet with children whose idiosyncrasies are such that irregularity occurs whenever they are affected with any disease. If no other sign is present, in such cases, I care but little for it.

PERCUSSION OVER THE HEART.



DIFFERENCE of *pitch or note* (99) is usually perceptible, in healthy persons, between the two breasts, the left being rather duller than the right. The space in which this difference is perceptible (93), begins on a level with the second rib and about a finger's breadth from the left of the sternum, and gradually widening on the sixth rib, it may there be two and a half or three inches broad ; viz. from the right side of the sternum to within one inch of a line let fall from the left nipple. This space is, at times, nowhere completely dull : but there is generally a small spot, at its lower part, about the junction of the left ribs with their cartilages, that is evidently flat. In health, this flatness never extends outside of the left nipple (260), and you may be sure either that there is displacement of the heart, or that some disease, as pericarditis or hypertrophy, exists, if you find it more extensive (275). The position of the patient has considerable influence, the dullness being augmented when in an erect posture or when leaning forward ; and, of course, the flatness extends towards either side that the patient may be lying upon. This fact

may be frequently taken advantage of in the examination of diseased conditions of the heart and pericardium.

248. Various diseases of the *lung* modify it. Emphysema tends to make more resonance over the cardiac region (177). Pneumothorax does the same in a more marked degree, and at the same time usually presses the heart out of its usual place (167). Pleurisy, with large effusion, likewise tends to thrust the heart from its usual place (140), and to augment the cardiac dullness. A distended stomach will sometimes encroach upon the cardiac space, and cause increased clearness, or dullness, according as it is filled with air or food. The liver, when enlarged, also encroaches in the same way, always, of course, augmenting the dullness (See Auscultatory Percussion, 389).

248 *a*. Its own diseases modify the sound on percussion. Pericarditis, with effusion of fluid (260), and rupture of the heart with an effusion of blood into the pericardium, hypertrophy (275), and dilatation (277), all augment the space of dullness. Endocarditis is said by some to produce the same effect (271). Atrophy of the organ will of course diminish it. Some talk of air in the pericardium. It has never been my fortune to meet with it.


ARTERIES.

INSPECTION OF ARTERIES.


INSPECTION in diseases of the heart (275, 292) very frequently affords a visible increased pulsation of both carotids. A similar local pulsation in any part may lead to the suspicion of aneurism (335).

250. A tumor over the artery may, however, cause a similar pulsation; hence arises a necessity for a cautious diagnosis. Chlorosis is apt to produce local pulsations in the carotid or cœliac arteries, for example (280).

PALPATION OF ARTERIES.

IMPLE increased throbbing in a part indicates merely increased action; an aneurism may give, in addition to a pulsation, the peculiar thrill called purring sensation (*fremissement cataire*) (206); this, however, is not constant. The examination of the radial pulse is of the greatest importance in all diseases of the heart. It *suggests* at times, by its irregularity, either organic changes in chronic diseases, or an inflammatory condition in acute attacks (246). A full pulse, in any chronic trouble of the circulation, points at hypertrophy, and usually without great obstruction of the aortic valves (275). A small, irregular, or dicrotic pulse, indicates a disease of the mitral valve, preventing the free passage of the blood from the auricle into the ventricle, and consequently a double beat is liable to occur (292).

MENSURATION OF ARTERIES.

ENSURATION is never used save in the case of a great prominence of some aneurism, as of the arch of the aorta (344), of the abdominal aorta, or of the popliteal artery.

AUSCULTATION OF ARTERIES.

By auscultation we always obtain a very slight sound, and an impulse over the various arteries of the body. These indicate nothing of importance; but, in cases of aneurism, a strong local sound (340) is heard, and if it cause any prominence of the external skin (344, *fig.* 38), an impulse is (336) felt in the part. A tumor over a healthy artery *may* produce the same effects (343). A bellows murmur not unfrequently attends a local aneurism. This sound was once considered very important as indicating aneurism. At present, it has much less value, except when connected with other signs of the same disease.

254. Chlorosis (220), prolonged hæmorrhage, and anhæmia, or any undue pressure of the stethoscope, frequently produce bellows murmur in the arteries (220); hence, be wary of inferences drawn from this murmur merely, however rough may be its character.

VEINS.

INSPECTION OF VEINS.



ULSATION of the jugular veins is not unfrequently the result of severe disease of the heart, causing patency of the tricuspid valves, and consequently a *régurgitation* into the auricles and veins (296). A similar phenomenon is observed in some peculiar cases, in which the capillaries of the body seem to allow the force of the heart's action to be continued directly through them into the veins. The two may be distinguished by observing that the course of the current of blood is, in the former case, contrary to that which it usually takes, while in the latter, it is only the natural current augmented by slight pulsations. In general it may be said that any disease which obstructs the circulation tends to produce enlargement of the superficial veins, especially of those about the neck.

PALPATION OF VEINS.



ISEASE of the veins is never recognised by palpation alone, but this method affords generally similar results to those given in the last section. In phlebitis of the extremities, however, this method of examination is invaluable, for by it we may at times recognise a hard, tender, rounded cord along the course of the vessel.

AUSCULTATION OF VEINS.

THERE is seldom any sound produced in the veins ; but in certain cases, for example, in chlorotic females ; in hæmorrhagic, and in anhæmic patients ; in all, in fact, who, from any cause, have less fibrine than usual in the blood, a sound called *bruit de Diable* is heard (311). It was named by Bouillaud, and resembles the sound produced by a toy. It is similar to the bellows murmur of the arteries, except that it is continuous. It becomes, in very marked cases, musical in its character, reminding one of the whistling of a violent wind. It is very variable, and depends much upon the degree and peculiarity of the pressure exerted by the stethoscope on the vein. Under too great a pressure it wholly ceases. I think I have observed it most distinctly when only one edge of the instrument has rested on one half of the right external jugular. It is augmented when the vein and sterno-mastoid muscle are made tense, by turning the head strongly to the side opposite to that which you are examining. It is most commonly heard only in the right jugular. In severe cases of hæmorrhage it may appear in other parts. This sound is pathognomonic of no serious disease.

PHYSICAL SIGNS OF PERICARDITIS.

DURING the *first* stages of the disease, that is, before any effusion of fluid has taken place, a *musical murmur* has been heard by Dr. Graves* (236). I have never heard it; but when the two layers of the pericardium are dry, and move less freely than usual upon each other, owing to their congestion, the sound like the *creaking of new leather* (*bruit de cuir neuf*) may be heard anywhere in the cardiac region† (236). There will probably be some irregularity in the motions and sounds of the heart, and perhaps, though rarely, a slight prolongation of the first sound (223), owing to the difficulty that the ventricles meet with in contracting. All these signs may be absent, or they may be of so short duration, that we may not have any signs but those of later date.

259. *Second.* A *rubbing* or *to and fro* sound (237), similar to that heard in inflammation of the pleura (128), occurs when lymph has been thrown out, and the pericardial layers have been made very

* Clinical Medicine, Dublin, 1843, page 910.

† This will vary in character, from a gentle sound, like the rustling of silk, to a rasping, grating, or croaking one. (Hope on Diseases of the Heart, p. 175, Pennock's Edition.)

rough thereby. This sound is much more frequently heard than the signs already described. When any difficulty arises as to whether the sound is caused by the heart or by the pleura, if you request the patient to hold his breath, you will usually be able to decide, for if it be caused by the heart the sound will continue. There may be exceptions to this (Note 237). It is liable to the same varieties observed in pleural and other rubbing sounds.* Some say that in this stage a bellows murmur (223) is, at times, heard. It may be so (77); but were I to hear a distinct bellows murmur, I should suspect endo-carditis (269).

260. *Third.* These sounds will all disappear, and instead of them you will have (in consequence of an effusion of fluid into the pericardial sack) an indistinctness of the sounds of the heart, and a great diminution, if not an entire absence, of the impulse. The latter happens when the effusion is very great. The space usually dull (248 *a*) becomes two, three, or four times larger than usual. If you find dullness outside of the nipple, you may be sure that considerable effusion exists. Sometimes a vibratory tremor is felt in this case.†

* A man died a short time since at the Massachusetts General Hospital in this city, over whose liver was felt and heard a rubbing sound, resembling the creak of new leather. It occurred on any motion of the parts. At the autopsy a very delicate membrane was found covering the liver. It was not rough, and scarcely explained the phenomenon.

† C. J. B. Williams's Lectures.

261. *Fourth.* The respiratory murmur is very much obscured ; or if there is a large effusion, and the lung is pushed aside to a great extent, there is an entire absence of the sound. I have known this want of the respiratory murmur to be observable from the second rib to the base of the chest, and from beyond the right edge of the sternum to the outside of the left nipple.

261 *a.* With this diminished respiration there will be a diminution of the *sounds* and of the *impulse* of the heart. The latter, in fact, may be wholly lost, if the pericardium is very much distended (215, 242, 243).

261 *b.* At this period likewise, a *washing* or *churning* sound is sometimes heard, caused by the motions of the heart in a fluid (238).

262. *Fifth.* You will perceive a prominence of the left breast, when compared with the right, and a pressing out of the intercostal spaces in the cardiac region (204). The position of the left nipple is usually changed, being higher than the right one.

263. *Sixth.* As the effusion subsides, and convalescence from the acute disease commences, all these signs will begin to disappear : and, finally, when the layers of the pericardium come again in contact, we may hear as in pleurisy (128, 237) the rubbing sound again, and it is favorable so far as it indicates diminution of the effusion (237). This rubbing sound may begin in one spot, for instance, near the junction of the third rib with the sternum, and extend thence

over the whole cardiac space, or it may be limited to a small spot.

264. *Seventh.* Finally, when convalescence is fully established, all the signs may disappear, and all the operations of the heart may become perfectly normal. Irregularity of motion, &c., may however remain, and it is probable that hypertrophy of the heart will gradually ensue, with all its train of severe physical and general symptoms (275, 6).

265. At times, after an effusion and the consequent contraction of the adjacent parts, it is said that there is a drawing in of the intercostal spaces at each movement of the heart.

266. *EXAMPLE.* Nothing is more indefinite than the *rational* signs of pericarditis. It is impossible to be sure of its existence, unless we have recourse to the physical signs. A most common case is as follows. A man is seized, either when healthy, or more commonly when affected with rheumatism, with a pain, either very severe or very slight, about the cardiac region. This is the more common case. At times, however, there is no pain. Dyspnœa may come on, and, though it is usually slight, it may become orthopnœa. With these there may be other more or less marked signs of trouble in the circulation; such as dizziness, œdema of the legs, &c.; but all these symptoms *may* be absent, and the disease would be *wholly latent* if we did not have the physical signs to inform us of its existence. If you happen to see the patient quite early you may only

obtain signs of some obscure disease about the circulatory system ; but of what character you may be doubtful. Any alteration either of the sounds or of the impulse, any irregularity of the rhythm, &c., may lead you to *suspect* pericarditis or endo-carditis. If *any* physical sign be combined with any local rational sign, such as a pain in the region of the heart, or palpitation, &c., your suspicions will be augmented. If, in connexion with these signs, or without them, you hear a superficial *creak* like the sound of *new leather* (236), you may be certain of your diagnosis, and decide that it is a case of pericarditis. Yet it is quite rare to hear this sign ; and if it be absent you must not necessarily infer that pericarditis does not exist. If you hear it, you will, in your mind's eye, see the two layers of the pericardial sack congested and drier than usual, and hence moving with less ease than ordinary. yet not sufficiently obstructed to present the next phenomenon ; viz. *rubbing sound* (237), which may come on within forty-eight hours from the first attack. Hearing this, either locally, about the third and fourth rib, near the sternum, where it would be most likely to commence, or, generally, over all the cardiac space, you may be certain that pericarditis exists, and that the opposing layers of the pericardium are even then covered with a tolerably dense and moist membrane, the motions of which, upon each other, produce the sound in question. This is the last moment for active, efficient treatment, if you have not used it before.

At this period you may perceive some obscurity in the movements of the heart (205); little or no increased dullness on percussion (248 *a*). In a few hours, if the disease be not checked, an effusion of fluid will take place and will separate the layers, push back the heart, destroy the rubbing sound, and you will have instead, great diminution in the strength of the sounds of the heart (215); absence of impulse (243); perhaps a sort of churning or washing sound (238), in consequence of the dashing of the fluid against the walls of the distended sack; dullness on percussion, which may extend from the second rib to the cartilages, and from the junction of the cartilage and right ribs to beyond the nipple of the left side (248 *a*); and, finally, an absence of respiration over a large part of the left breast (owing to the pushing aside of the lung), with prominence of the same point (204). These are the most perfect and undoubted physical signs of pericarditis. If the disease is prepared to yield, all these signs will diminish, the prominence will disappear, the dullness on percussion will diminish; perhaps the rubbing sound will be again heard, and then it will be very favorable, as it will indicate an absorption of the fluid (237). It will usually commence near the origins of the aorta and pulmonary artery, and will extend thence over the cardiac space, and may last for weeks; the impulse and the sounds of the heart will be felt and heard more distinctly, and gradually all symptoms will disappear. But this is not the common course, for pal-


pitiation usually remains for some time, and not unfrequently this symptom will go on augmenting until the patient will finally sink under the signs of confirmed hypertrophy of the heart (275).

267. *Chronic Pericarditis* presents very much the same signs as those described for the acute disease, therefore it is useless to speak of them. Moreover, they are frequently connected with hypertrophy.

PHYSICAL SIGNS OF CARDITIS.

IN the present state of science I doubt whether any one would attempt the recognition of carditis, uncombined with pericarditis or endo-carditis. And as Laennec and Hope confirm my view, I shall pass on.

PHYSICAL SIGNS OF ENDO-CARDITIS.

IGNS of endo-carditis derived from auscultation are frequently unsatisfactory, for there is no perfectly *undoubted* physical sign of endo-carditis. But we can make an approximation thereto. The chief sign is a *bellows murmur* (220), either with the first or second sounds of the heart. This is usually dependent upon obstruction, by lymph, of some of the orifices of the heart. This bellows murmur, in an acute attack, may vary. It is usually soft, but it may be very rough, and, generally, unless the affection is relieved, it is so when the disease becomes chronic, and then it may pass through all the phases of this murmur (223).

270. In addition to this, we may have an irregularity and an increase of the impulse (245), owing to the irritation of the organ.

271. According to Bouillaud, you should find an enlargement of the ordinary dull space in the cardiac region, owing to a swelling of the heart as in inflammation of any other part (248 *a*).

271 *a*. Finally; unless the disease is checked, permanent obstruction or regurgitatory murmurs (226) may appear, with signs of hypertrophy (275).

272. **EXAMPLE.** This disease is most frequently the result of a rheumatic inflammation of the lining membrane of the heart. Not uncommonly, during this disease, the pains will leave the extremities, and a dull aching sensation, and, more rarely, a severe pain, will be felt in or near the cardiac region. It may be so slight, that the patient will frequently neglect to speak of it, and will think himself wholly recovered, so freely is he able to move. Daily auscultation is therefore necessary; and, if endo-carditis is commencing, you will probably hear some prolongation of the first sound (223). This may, perhaps, be very slight, but more important, from that fact: because, at this time, you will have the disease, comparatively speaking, under your own hand. There is not generally a very marked increase of the impulse of the heart (240, &c.), and not often an enlargement of the dull space on percussion (248 *a*). This stage may be checked and your patient may get well; the bellows murmur may either subside entirely, or may remain as a mere trifle, owing to a slight disease not sufficient to impair the health. This period you may overlook, or you may be unable to check it, and your patient, in a few weeks, will probably complain of palpitation and of some dyspnœa. The bellows murmur will then have become more rough (223), and the impulse stronger (245). Remedies may relieve, but they rarely cure in this stage of the disease; for the lymph deposited on the valves, &c., will have too firmly obstructed the valvular appara-

tus. The disease may continue for months, and the patient may have the same physical signs and no great deterioration of health; or he may, from inattention to the rules of health, become more ill, and be finally affected with hypertrophy of the heart (275) and the symptoms usually following in the train of this combination. This may be given as an example of an acute attack, but the majority of cases progress more quietly and the signs are less distinct. For the peculiar sounds, and the results produced by endocarditis, affecting the various valves, see from 294 to 316.

DIAGNOSIS OF ENDO-CARDITIS, ETC.

DURING most of these acute diseases, it is of no importance whether you make an exact diagnosis, or remain satisfied with the general idea of an inflammation of one or more of the textures of the heart. If you have decided that your patient has an acute inflammatory attack of either the covering (pericarditis), the substance (carditis), or lining membrane of the heart (endo-carditis), do not stop to make an accurate diagnosis, but use your remedies *instantly*. Let them be of the most active character. God speed the most speedy and efficient worker, for either of these diseases *may* entail a lifetime of misery. Endocarditis is the most formidable; but pericarditis is, generally speaking, of no small moment. Finally, I suspect that they are generally more or less combined; and then you may have their various signs combined together in the case. But if you want to make a more refined analysis of the signs, the following table may help you. I shall unite carditis and endo-carditis under one head.

PHYSICAL SIGNS.	ENDO-CARDITIS AND CARDITIS.	PERICARDITIS.
<i>Tenderness on pressure over the cardiac region.</i>	Usually none.	Sometimes.
<i>Prominence of the chest.</i>	“ “	Decidedly, after effusion.
<i>Impulse of the heart.</i>	Strong, usually irregular, and may give a purring sensation.	Usually not strong at first; null when effusion has taken place; irregularity, not marked; rarely if ever purring sensation.
<i>Sounds of the heart.</i>	Bellows murmur; deep-seated; heard more generally over the chest.	Rarely a bellows murmur, especially of a rough character; and a sound of creaking leather or a washing sound, quite superficial and usually more limited.
<i>Results of percussion.</i>	Dullness rarely so extensive as in pericarditis.	Dullness may be very extensive and it is usually great; if it be not so, the disease is slight.

SIGNS OF HYPERTROPHY OF THE HEART.

PURE hypertrophy rarely exists without some lesion of the valves. Its signs are an increased, heaving impulse (245), moving at times the whole of the left breast, and perceptible through the clothing;* more dullness on percussion (248 *a*); a throwing upward and outward of the apex of the heart, with the chief point of impulse nearer the nipple than in health (204); irregular action, not necessarily but frequently, and in severe cases at times a diastolic or back stroke; diminution of the sounds of the heart (215), and often a soufflet with them (223). If there be hypertrophy of the left ventricle and the aortic orifices be free, a strong impulse may be felt at the carotids, &c. (251). If the same case occur with the right ventricle, a pulsation of the jugulars is frequently felt (255). In severe cases, there are less respiration, owing to the lungs being pushed away (261), and prominence of the left breast (207). The diagnosis of the varieties of hypertrophy, given by

* This is usual, but other cases of hypertrophy have been observed in which it was *slight*, owing to an obstruction in the motions of the heart.

authors under different names (viz. first, hypertrophy with a diminished cavity ; second, hypertrophy with the cavity normal ; third, hypertrophy with cavity augmented in size), is of little importance so far as treatment is concerned. In a word, it may be said that, by percussion, you will usually be able to recognise the difference between the first and third, for the dullness will be over a larger space than normal in the third, but of normal size in the first.

EXAMPLE OF HYPERTROPHY.

276. This may occur at any age. When called to your patient, you will probably find that he has been suffering more or less with trouble about the heart. Sometimes the symptoms are very obscure ; perhaps, merely a sense of fullness about the breast ; a tendency to palpitation ; but the general functions of the body may all go on very well, and the countenance may appear even more fresh than usual. In this case, you may have no physical signs save a stronger impulse to the ear (245), and even that may sometimes be mistaken for the result of agitation of mind. As the disease goes on, a greater extent of dullness on percussion becomes perceptible ; the lung seems pressed away : the action of the heart becomes stronger ; its apex does not strike between the fifth and sixth ribs as usual (204), but higher up and further from the sternum, or over a larger space than usual. The symptoms are greater ; the dyspnœa is

more marked; and the general health is impaired. Finally, you will have all the distinct signs given above: a heaving impulse over a large space (205); great dullness on percussion (247); *usually* diminished sounds of heart (215); and, generally, some irregularity in the movements (219); and sometimes a strong bellows murmur (223). With these come more severe rational signs, ruined health, orthopnœa, dropsy, &c.

SIGNS OF DILATATION OF THE HEART.

THERE is dullness over a larger space than usual (248 *a*). The sounds are sharp and clear, so that they are very much alike in character; the impulse is less than in health (242), and much less than in hypertrophy (275). The respiratory murmur is likewise diminished or absent over a larger space than usual (28). Such are the signs given by authors. But I doubt if any one can always make an accurate diagnosis of this affection. The fact is, it is rarely seen except as connected with hypertrophy. Still it is well to remember it in cases where the sounds are clearer than usual, and both are very much alike, when, according to Williams, they resemble the words "Lup tup" instead of "Lubb tup" (210); for these signs, in any disease of the heart, when combined with a slight, soft impulse, and an augmented dullness on percussion, should lead you to suspect dilatation (242, 248 *a*).

278. The following case illustrates in some degree the effects of dilatation of the heart without serious lesion of the valves, also the effects upon the jugulars from hypertrophy of the right ventricle.

A. B., aged 49, mariner, entered Massachusetts General Hospital, Dec. 31, 1841. He had been a great

sufferer from rheumatism, and had occasionally had dyspnœa, palpitation, œdema, &c., for four years. Nine months previous to his entrance, his symptoms had increased, so that he lost the power of laboring, and dropsy had ensued. At his entrance he was evidently suffering from serious difficulty in the circulation. The physical signs noted on the day after his entrance were, impulse of the heart, generally rather feeble, with an occasional very forcible and double stroke (246). Neither sound was prolonged (223), the second was less abrupt than usual. Percussion not dull over a great extent in the cardiac region (247). On the next day, great irregularity of motion (246), and feeble impulse was observed (242). Finally; a slight pulsation of the jugulars was perceived, especially in the right side of neck (255). The patient died sixteen days after entrance, and at the autopsy the heart was found nearly twice as large as usual. The parietes of the right side were twice as thick as usual. Those of the left were slightly hypertrophied, but the cavities of both sides were enlarged. The valves were all well.

SIGNS OF ATROPHY OF THE HEART.



UTHORS speak of this, but I have never seen it so as to be able to recognise it before death; nor do I believe that it will ever cause such serious trouble as to need your attention.

NERVOUS AFFECTIONS OF THE HEART.


I USE this word *nervous* to designate certain cases of palpitation, &c., unaccompanied by organic disease of the heart. You will know what the term means after you have been in practice a short time. It is very important that you should recognise the affections included in this class, and distinguish them from organic diseases. The physical signs are, a normal sound on percussion; increased impulse, with a fluttering, disagreeable to the patient (244); at times a variable bellows murmur (223), usually with the first sound; and a tendency to a bruit de diable (257) and bellows murmur in the veins and arteries; and not unfrequently a pulsation in the latter (251).

281. **EXAMPLE.** A chlorotic female, a nervous or debilitated man, may present these symptoms. The palpitations may be so severe as to render life a burden, but the severer symptoms, dyspnœa, orthopnœa, or œdema, are rarely found. You may produce all of them by bad treatment. I knew a female who had been bled every fortnight for nearly two years, for what was supposed to be severe disease of the

heart. She was in a state of anhæmia. The throbbing of the heart and rapidity of its fluttering were extraordinary, and during her attacks she suffered extremely. In such a case a bellows murmur, sometimes of a very rough character, is heard, but the impulse, in this case, was not felt over a large space, nor was the dullness greater than usual. The patient held her hand over her heart, as if to restrain its motions. She died, and no disease of the organ was found. The symptoms are always eventually aggravated by the depleting treatment, and the improvement under the tonic course is one of the most important diagnostic signs.

281 *a*. This was a very severe case, but every degree of nervous palpitation below this may be observed in the various cases which will fall under your notice. In the absence of the severer general symptoms, and the normal amount of dullness over the cardiac region, the nervous character of the patient will usually enable you to decide, that the disease is functional rather than organic. Nervous palpitations of a most severe character at times arise from dyspepsia. Hence any derangement of the digestive functions will become an important item to be considered in making your diagnosis.

SIGNS OF VALVULAR DISEASE.

 ANY times there is thickening merely, with slight obstruction of the movements of the valves, but not enough to produce valvular murmurs. In these cases Bouillaud* recognises what is called a *parchment-like sound*. I have not heard it; but I can conceive it to be possible to recognise it. As it, however, does not indicate any very severe lesion of the valves, it is of minor importance (235).

* *Maladies du cœur, &c.*, par le Docteur Andry (262).

OBSTRUCTION OF THE MITRAL VALVE.



RECOLLECTING that the force with which the blood is projected into the ventricle is generally slight, owing to the weakness of the auricular contraction, we might, *à priori*, expect that to happen which really does occur, viz. any sound caused by obstruction of this orifice is usually imperceptible, and it is at all times very slight. Consequently, you *may*, at an autopsy, find evidence that there must have been serious obstruction to the blood passing from the auricle into the ventricle, when there has been no sign to mark it during life. It would be most manifest just before the first or dull sound (233), and would be very likely to be continuous with it. By referring to diagram (*fig.* 36, 228) you will see that at the latter part of the period of ventricular rest, the auricle contracts smartly and dilates the ventricle, which latter immediately begins its systole. But there is another period manifested by the diagram. At the end of the ventricular systole, the auricle is most dilated. Suddenly an active dilatation or diastole of the ventricle takes place, and the blood from the distended auricle falls into it;

hence this obstruction-sound may occur just before or just after the first sound, and, in the last case, it would be identical with the second sound, which occurs, of course, at the moment the diastole begins.

284. The point of greatest sound for this murmur is over the left ventricle, i. e. (*fig. 33*, 213) between the third and fourth ribs, and two inches from the sternum.

285. *Impulse of the heart.* Irregular beating is almost always an accompaniment of an obstruction of the mitral valve, the blood being unable to pass rapidly enough into the ventricle to distend it, before the systole commences. Hence the ventricle makes two or more small spasmodic contractions, and consequently impulses, to a single firm one, which occurs only occasionally when the ventricle becomes full. This irregularity is usually perceptible at the radial pulse, but not always, and the pulse may seem very slow and regular, corresponding to the full beats of the heart. The amount of irregularity and inequality of force depends on the amount of disease (246, 251).

286. It is but right to state, however, that according to Hope,* the same kind of pulse may be found in softening of the heart, great pericardial effusion, and polypi from endo-carditis. But in these cases there is, usually, no valvular murmur, and there are other signs diagnostic of each.

* Hope on Diseases of the Heart, page 360.

287. *Inspection, mensuration, and palpation* give few other results of importance, than those revealed by auscultation.

288. The following case illustrates what has been stated. I have obtained it from Dr. Hope.*

"Dilatation and softening of all the cavities: hypertrophy of the right ventricle; attenuation of the left; great contraction of the mitral valve; fatal polypus.—Mrs. L——n consulted me Dec. 27, 1829. She had livid lips; a defined purplish red on the cheeks: complexion elsewhere sallow; dyspnœa and palpitation, excited even by walking across a room, and to excess by ascending a flight of stairs; frequent cough, preventing sleep; constant copious expectoration of frothy, viscous mucus, the temporary suppression of which, by sleep or opiates, caused paroxysms of excessive dyspnœa and orthopnœa; chilliness, particularly of the extremities; universal and extreme anasarca; catamenia regular; bowels open; pulse small, weak, unequal, and intermittent; urine scanty and high colored; thirst; anorexia.

Complaint commenced ten years before I saw her, and was attributed to difficult parturition. The symptoms were always greatly aggravated by 'colds,' to which she was particularly liable. She frequently had slight œdema pedum, which subsided spontaneously. Always felt best in a warm, humid atmosphere.

* Hope on Diseases of the Heart, Pennock's edition, page 518.

Auscultation.—*Impulse* imperceptible. *Sounds.* Both were short, flat, and audible so far as the right clavicle. They were weaker on the left side of the heart. Murmur was not noticed. By the usual diuretics and aperients, the dropsy was completely removed in six weeks, the strength being little impaired and the appetite good. She was then suddenly seized with oppressed palpitation, suffocative orthopnœa, constant nausea and over-exhaustion, anxiety and jactitation. The dropsy began to re-accumulate, the sense of suffocation became agonizing, the pulse failed entirely for twenty-four hours before death, and she sank a week after the relapse.

Autopsy.—Pulmonary apoplexy and engorgement. *Heart* double the natural size, and very flaccid and pale. *Ventricles.* Right dilated to double; its parietes were not attenuated, and the columnæ carneæ were hypertrophous. The left was less dilated, and its walls were reduced to one-third of an inch in thickness. *Auricles.* Right, dilated; its parietes thin and diaphanous. Left, greatly dilated, considerably thickened, and almost completely filled with a polypus adhering firmly to its lining membrane. *Valves.* Aortic, slightly cartilaginous, but unimpeded. *Mitral*, contracted by cartilage into a *slit* which only admitted a writing quill. *Liver* slightly enlarged, granular, and of yellowish brown color.

Remarks.—This case is remarkable as presenting a degree of valvular contraction seldom if ever exceeded, and as showing with how great an amount

of disease life may be prolonged for a series of years."

REGURGITATION THROUGH THE MITRAL VALVES.

289. *Auscultation*.—The most striking phenomenon in this disease is a bellows murmur, which may vary from the slightest breezy character up to the saw-mill sound, according to the kind of disease of the valve and to the amount of that disease. A very rugged and at the same time permanently open orifice is usually supposed to produce a rougher sound than when the valve is smoother but equally open (226). Hope speaks of it as resembling a distant whispered *who* (234).

290. This murmur is, of course, connected with the first sound, because it must occur during the systole of the ventricle (*fig. 36, 228*). It may be so loud and long as to obscure the second sound; but this is not usual. It is heard most distinctly between the third and sixth ribs (*fig. 33, 213*) over the left ventricle. It radiates from the spot corresponding to the valve, and is heard but slightly along the carotid. Hence arises a means of diagnosis between this and disease of the aortic valves, the sounds from the latter passing along the carotids and aorta, so that they are heard over a larger space than these of which we are now treating (227). This sound may be caused by anything that causes any degree of patency of the valve, for example, anything that con-

tracts the chordæ tendineæ; by atrophy of the valves; by their adhesions; by their dilatation in consequence of dilatation of ventricle; finally, by mental excitement causing undue action of the organ, in which case a momentary regurgitation may occur (220, 225).*

291. *Percussion* gives no characteristic signs.

292. *Inspection, palpation, and mensuration* afford no *certain* signs of this disease, though palpation indicates at times an increased impulse of the heart, from hypertrophy, which frequently, though not necessarily, accompanies the disease. An irregular or *dicrotic* impulse at the heart, at the carotid and radial arteries (251), with the purring tremor in the cardiac region (206), is likewise very common.

293. The following case illustrates the above remarks.

T., aged 13, of a feeble constitution, and having suffered with chronic disease of the heart, entered the Mass. General Hospital, April 1, 1845. He was delirious, and had been so for a week or more. He

* Notwithstanding this sound has been considered one of the most constant of the abnormal murmurs in valvular disease, I find it is doubted by Dr. Ranking whether any sound really occurs from regurgitation through the mitral orifice. He thinks that when a murmur is heard, it is always owing to some aortic obstruction coexistent with mitral regurgitation. In proof that this is an erroneous statement, at least when made in so general a manner, I refer to the case which is given in the text (293). It is well, however, for you to be cautious about being equally dogmatical in the other extreme (313, &c.)

died six days after entrance, of tubercular meningitis. The physical signs relating to the heart, were a strong impulse and a bellows murmur over the ventricles, connected with the first sound, while the second sound was normal. At the autopsy, the aortic valves and those of the pulmonary artery were normal, and held water most perfectly. The water passed freely through the mitral valve. It was thickened, opaque, hardened, and contracted, as were likewise the chordæ tendineæ and columnæ carneæ attached to it. In other words, there was exactly enough of disease to seriously obstruct the action of the valve, and allow the blood to be thrown back into the auricle with each ventricular systole. The heart was normal.

OBSTRUCTION OF TRICUSPID VALVE.



As the same physical conditions exist in this case as in obstruction of the mitral valve, you may refer to the description of that (283). But you must bear in mind these facts. First, it is very rare that disease of the tricuspid exists alone. I do not remember to have ever seen more than one case, and, in that, the disease was very slight. Second, as there is usually very slight disease, the valves are rarely obstructed in their operation.* Their murmurs resemble the “*who*” of the mitral valve (289).

295. For the spot at which the morbid sounds resulting from it will be most distinctly heard, you may refer to diagram (*fig. 33*, p. 213), and see that it will be near the junction of the fourth and fifth ribs with the right of the sternum, and extending up diagonally along the sternum.

REGURGITATION THROUGH THE TRICUSPID VALVE.

296. This, as a morbid change, is very seldom found (Hope).† I refer to the last article for the parts


* Hope on Diseases of the Heart, page 104.

† Ibid., p. 105. Pennock, however, says it is heard not unfrequently.

at which you shall auscult ; and also to the article on regurgitation through the mitral valve, for the principles on which the sounds are produced (289). It is liable to produce a pulsation of the jugulars, caused by the throwing back of the blood from the ventricles into the veins with each contraction of the ventricles (255).

OBSTRUCTION OF THE AORTIC VALVES.

AUSCULTATION.

OME obstruction of these valves is very common, and a bellows murmur of any variety may be heard in consequence thereof. It may simply prolong the first sound (223), or it may mask it by a sawing or rasping character (223). It is usually heard most distinctly over the aortic valves, and thence radiates, being less distinct as you go further from the valve. It is transmitted very strongly along the carotids, and less distinctly down the back along the aorta (229). Hence one diagnostic sign between this and diseases of the mitral valve (227). It occurs during the systole of the ventricle. It is generally very superficial, and sounds like a whispered "r" or "s." The *impulse* is usually augmented (245) in consequence of hypertrophy of the ventricle (275) arising from obstruction to the proper performance of its duty of sending the blood over the body. There is very commonly an irregularity in the beats, because the ventricle is obliged to make one or more contractions to overcome that obstruction (246).

298. *Palpation.* At times, there is a thrill (206),

as the purring sensation, but this may happen in any disease of the heart where there is a great obstruction. The pulse at the wrist will be small if there is great obstruction, though the impulse at the cardiac region be very strong.

299. *Percussion*.—Dullness generally over a larger space, owing to a distension of the heart or hypertrophy. This, of course, ordinarily supposes a chronic disease. There may exist no abnormal dullness.

300. *Inspection* gives no results unless hypertrophy exists (275).

301. For an example of this combined with regurgitation or diastolic sound, see (306).

REGURGITATION THROUGH THE AORTIC VALVE.

302. *Auscultation*.—The blood not being retained by the semilunar valves, returns during the diastole of the ventricle. Of course it immediately follows the second sound. A slight musical murmur or bellows sound is thus produced, either immediately following or masking the second sound. It is heard over the aortic valves (*fig. 33*), also in a less degree down along the ventricle. It is generally slighter than the sound from obstruction, and sounds like a whispered “*awe*” (234).

303. *Inspection* teaches but little unless hypertrophy exists. The *impulse* may be somewhat irregular, at times a back-stroke is perceived, and the pulse is jerking (246, 275).

304. *Percussion* and *mensuration* reveal nothing.

305. *Palpation* may give a thrill (206).

306. EXAMPLE. The following taken from Hope* will afford examples of the sounds usually heard in the three conditions of the valves commonly found in diseases of the heart, viz. disease causing, first, regurgitation through the mitral valve (289); second, obstruction of the aortic valve (297); and, third, regurgitation through the same (302).

V., aged 50, had a weak, irregular, unequal, and small pulse. For three years he had been short winded. Impulse natural (showing no hypertrophy) (205). A musical note, loud, sounding close under the ear an inch below, and a little to the sternal side of the left nipple, accompanied the first sound of the heart (289). (The position, viz. over the mitral valve; the time, viz. during the systole, or with first sound, and finally its diminution on ascending the ventricle; all these indicated the mitral valve to be its seat, and that the orifice was *insufficiently* closed.) On ascending higher, a musical note, still with the first sound, became again audible, and became perfectly distinct over the aortic valves (297); then two inches along the aorta, where it seemed more superficial than at the valves themselves (334). This musical note was mixed with a common murmur, which was also heard along the aorta. Both sounds were very indistinct along the pulmonary artery. (The musical note still accompanying the first sound,

* Hope on Diseases of the Heart, page 527.

and heard over the aorta, indicated *obstruction* of the semilunar valves of the aorta, while the sound becoming more superficial above the aorta, might lead to the suspicion that there was some roughness of that vessel). The second sound over the aortic valves was *tailed* by a feeble though distinct blowing like a whispered "*awe*" (234), which decreased on going down over the ventricle, and was prolonged to the ensuing ventricular systole. (The time, viz. that of the second sound, and immediately connected with it, the place at which this was heard, viz. over the aorta, indicated regurgitation through the semilunar valves of the aorta (302, 231) during the whole period of the rest of the heart.)

OBSTRUCTION OF PULMONARY ARTERY VALVE.



ISEASE of this valve is a very rare circumstance. Consequently, a marked sound connected with it is very uncommon. In fact, I should rarely have suspicion of any disease existing in the pulmonary artery without some affection of the aorta, for such a state of things is seldom seen. There are some malformations of this part, but in these cases the trouble is congenital. I do not absolutely deny the existence of disease of this artery solely, but I mean to say that it is very rare, and that I have never seen a case.

308. Still there *may* be some disease of it, and therefore it is proper to know that, by following the rules laid down for auscultation of the aortic orifice, but changing your place of examination to the left breast, and ausculting away from the sternum instead of upon it, you may generally come to some conclusion (*fig. 33, 213*). Another fact should be borne in mind. The clapping sound of the healthy pulmonary artery valves will usually be heard, even when there is serious aortic disease, with loud and very marked sounds consequent thereupon. If, therefore,

in a case of serious disease of the heart, with very morbid sounds, you discover that this second sound is wanting, you may *suspect* disease of that valve. But you cannot be sure of it, for a loud bellows murmur or irregularity of the sounds and motion of the heart may obscure the sound of the healthy pulmonary artery valve.

REGURGITATION THROUGH THE PULMONARY ARTERY.

309. This likewise is very rare. I have never seen a case. The sounds, of course, would be less than over the aorta, and to the left of it (*fig.* 33, 213).

EXAMPLE OF DISEASE OF THE PULMONARY ARTERY.

310. The following case is very interesting and instructive. I quote from Pennock's edition of Dr. Hope's work.*

S. W., aged 36, yellowish complexion ; short winded for ten years, owing, she thinks, to striking the chest against a post. Dyspnœa on entrance ; pain in scrobiculus cordis ; ascites, œdema. Pulse seventy, large, full, rather tense. Great dullness over the heart, prominence, pulsation and purring sensation between the cartilages of the second and third left ribs. (The last point was immediately over the place of the pulmonary artery.) *Impulse* of the heart, much more extensive and considerably stronger than

* Hope on Diseases of the Heart, page 531.

natural, particularly in the left præcordial region. Pulsation, felt in epigastrium. *Sounds* of the heart. The first was an extremely loud, harsh, and superficial sawing sound, extensively audible, and most so over the prominence of the second and third ribs. (The place of the sounds indicated the pulmonary artery as the most probable seat of disease.) *Diagnosis* by Dr. Hope. Hypertrophy and still more dilatation of the heart, greatest on the left side. Dilatation of the origin of the aorta, probably forming an aneurismal pouch towards the left. At the autopsy the facts were as follows: Hypertrophy and dilatation of the heart, *aorta* contracted; *pulmonary artery* dilated to a circumference of four inches and a half,

PALPITATIONS IN DYSPEPSIA, ETC.



ALPITATION is a very common symptom in old dyspeptics, and in students. In these cases there are usually no severe rational signs; the dyspnœa and palpitations being the only marked ones. There are no physical signs, or they are but a slight prolongation of the sound; and sometimes increased impulse, at the first part of the examination, which subsides in a short time. These negative signs may, at times, become of great importance. Not unfrequently, in purely dyspeptic cases, especially in females, you may hear in the jugulars the *bruit de diable* (257). I should consider this a favorable omen; because it is very rarely, if ever, heard in organic diseases of the heart or large vessels.

GENERAL REMARKS ON VALVULAR DISEASES.

REMARKS AND CAUTIONS ON VALVULAR DIAGNOSIS.

By considering what we now know of diseases of the heart, and the comparative accuracy of our diagnoses in all these complaints, with what the medical profession knew before Laennec arose, the difference is seen to be immense. The following are some of the important advantages gained by auscultation.

First. *Pericarditis* was never definitely recognised before death. Since Laennec, Louis, Bouillaud, and others have written, it has become an easy thing to recognise it even in its earliest stages (258).

Second. The common rational signs alone of diseases of the substance of the organ were known; of course, therefore, none but the most general and indefinite results could be obtained. This must be evident even to the greatest sceptic in regard to the usefulness of auscultation.

Third. Formerly, the recognition of the differences between organic and functional diseases was at times very difficult, if not impossible.

Fourth. Scarcely a quarter of a century has elapsed since the time when the slightest approach to a decision of the particular valve that was diseased was never thought of. Thanks to the followers of Laennec; Bouillaud, Hope, Louis, Williams, Graves, Stokes, Bellingham, and others; we now can attempt to solve all these problems, and, in the majority of cases, may, with a due degree of care and a careful estimate of the relative value of the various physical and rational signs, come to an accurate decision.

313. Why should we complain then, if, in some cases, we cannot determine the peculiar structural disease that may exist? That such is the fact, that mistakes are not unfrequently made by the best auscultators, I know from having seen these errors committed, and from the writings of others.*

314. Still further; ought we to complain if, at times, even good auscultators decide that a case is one of organic disease, when, in fact, the heart is perfectly healthy, but interrupted in its action by the influence of adjacent organs?†

315. I would, therefore, make the following remarks, as warnings to the young auscultator.

* Messrs. Graves and Stokes, a few years ago, published their manifesto of unbelief in the accuracy of some of the rules of diagnosis in diseases of the heart from the physical signs alone. See Hope's case (310).

† See New York Journal of Medicine and Surgery; article by Dr. Swett, in which notice is taken of a severe form of bellows murmur, in consequence of the heart being pushed out of place by an abdominal tumor.

First. Be careful about inferring *too much* from physical signs *alone*.

Second. Do not risk your reputation by too nice a diagnosis.

Third. If you make an error, comfort yourself with the belief, that, perhaps, part of the difficulty lies inherent in the subject, and not wholly in your unpractised ear and incorrect judgment.

Fourth. If you make many errors, still be hopeful, at thinking how much more clear-sighted you are than those who have gone before you. Believe that auscultation teaches very much, although it may be imperfect. Learn humility ; but do not despair of becoming more accurate in future.

Fifth. Above all, do not, from the *physical signs alone*, imagine that you have found out a severe organic disease of the heart, when, perhaps, nothing but a functional derangement really exists, that will mock your fatal prognosis.

316. *Example* of my method of examining a man who appears, on inquiry, to have the symptoms of chronic disease of the heart, viz. palpitation, dyspnoea, perhaps orthopnoea, dropsy, &c.

If possible, I examine the patient both in the erect and recumbent posture. I remember particularly the rules already given (1, 202).

Inspection. I remove all the clothing from the chest and neck, and I observe if there is any evident pulsation about the cardiac region, and, if there be any, whether it is over a large space (245) ; whether it is

rolling and irregular ; whether it is out of the right place, between the fifth and sixth left ribs (205) ; whether there is any local pulsation over the aorta ; or any unusual prominence over the heart (262) ; remembering, however, on this last point, that a slight prominence may exist, without any disease of the heart ; owing to a want of symmetry in the two sides of the thorax (6). Passing my eye upwards, I observe whether there is any pulsation or prominent distension of the jugulars (255) ; whether there is any unusual fulness about the neck generally. If any one of these signs exist I *suspect* organic disease. If all of them occur I am nearly certain of that fact. The differential diagnosis, as it is called, of the particular disease, I refer to a later stage of the examination. I then proceed to,

317. *Palpation*. If I find a full heaving impulse (205), especially if it be irregular, or connected with the purring thrill (206), if the head of the auscultator is raised with every action of the heart, if there is a back-stroke (275), or an irregular jogging motion (246) ; if these or any of them are felt, my suspicions are confirmed that serious disease of the heart exists. If there is a thrill over the aorta (251), I should fear disease there as well as in the heart.

318. *Mensuration* may be of importance in giving the exact arc of the prominence of the chest, but I never make use of it. Inspection is far better for me (262).

319. *Percussion*. I rely very much on this, for

by it I learn the *size* of the heart. If there is greater dullness than usual over the heart, especially if it extend outside of the nipple, and beyond the right side of the sternum, I fear hypertrophy (275), dilatation (277), or pericarditis (260); the first usually, in a chronic disease, and I decide between these diseases by the examination of the other signs.

320. Finally, I *auscult*, first with my ear, to get a general idea of the sounds; but, in order to localize distinctly the various sounds, the stethoscope is absolutely necessary. Dr. Hope advises us always during auscultation, to keep the hand on the pulse. I frequently find it important to do so.

321. If, under these circumstances, with inspection, palpation, and percussion favoring the idea of severe disease of the heart, I hear first a modification of the first sound, whether as a simple soft prolongation of it, or the severest rasping sound (223); second, if, moreover, this sound is most distinct over the sternum about the second rib, and it extends up the carotids, and is less distinct below over the ventricles of the heart; third, if this occur at the time of a strong systole, I infer that the aorta is *obstructed* (297), and that the heart is probably larger than usual.

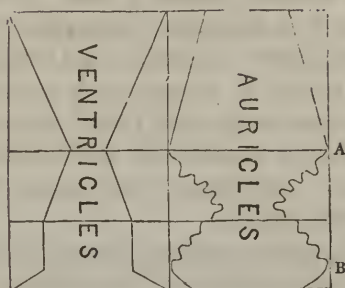
322. If, on the contrary, the same modification of sound be heard after the second sound as a tail to it, as it were, I should think that the heart was enlarged and diseased with aortic insufficiency and *regurgitation* (302).

323. Again; suppose the sound is heard lower down and towards the left nipple and apex of the heart, and that it is not so distinctly heard, or perhaps not at all heard along the carotids; suppose it still exists during the systole of the ventricle and with the radial pulse, I should infer that the mitral valve allowed the blood to be thrown back into the left auricle, or, in other words, there was *insufficiency* of the mitral valves.

324. Finally, if the sound is very slight and in the same place, if it immediately precede either the ventricular systole or diastole, I should suppose some *obstruction to the mitral valve* (283); for, in that case, the auricular contractions at the end of the period of rest would cause a slight murmur, by the attempt to force its blood into the ventricle before its systole.

325. A similar sound might be heard when the blood falls from the highly distended auricle into the ventricle at the beginning of its diastole (233). To make this more evident let us refer to our diagram already used (*fig.* 36, 228).

Fig. 37.



It is evident, I think, that at the points of time, A, B, a fluid is rushing with impetuosity from the auricle into the ventricle, and, of course, some sound must be produced. This sound, in both cases, is always slight; it is sometimes imperceptible; it is strongest at B, because there the auricle contracts and *forces* the fluid onward, whereas in the other case it is simply a *falling* of the fluid from the auricle into the ventricle (233).

325 *a*. Similar remarks might be made in regard to the pulmonary artery and tricuspid valves. The places in which the sounds would be heard would be changed. Those of the former would be transmitted up the carotids less than murmurs from the aorta; and sounds from the tricuspid would be perceived strongest under the sternum (*fig. 33*, 213).

326. If instead of only one of these sounds I hear several, as, for instance, the sounds of mitral regurgitation and of aortic obstruction and regurgitation,

the only inference I make is, that *both* of these valves are diseased instead of one. It must be confessed that it is sometimes impossible to distinctly localize the sounds. In such a case I think it scarcely worth the trouble to attempt to do so, inasmuch as I can at least be certain that I shall have to deal with serious valvular disease, and in this case I settle by percussion, or auscultatory percussion (389), the exact size of the heart.

327. But, finally, supposing that the rational signs have led me to believe in the existence of organic disease, and I find on inspection and palpation some abnormal impulse, but no increased dullness on percussion, and no morbid sound on auscultation; of course the physical signs become the sheet-anchor of faith for myself and my patient, and I tell him he has no *severe* disease. Some may say I may be deceived. Very true, but the risk of being so is infinitely small, whereas if I express a doubt to my patient I make him miserable and do myself no good. I am satisfied that the number of cases in which such a declaration would be correct are not a few.

MALFORMATIONS OF THE HEART.

IF you remember that these are congenital and that no hope can be entertained of doing any good by treatment, you will see that it is of little practical importance to attend to the physical signs. They vary in every possible manner. The bellows sound is usually the most common, with irregularity in the rhythm (223, 219).

SIGNS OF MALPOSITION OF THE HEART.



ALPOSITIONS of the heart may be congenital, or the result of disease. The congenital are those in which most of the organs of the body are exactly reversed in their position.

The heart lies in the right chest, the liver in the left hypochondrium; the arteria innominata is given off to the left, &c.

Inspection shows the apex of the heart beating to the right of the sternum.

Palpation may give the same.

Auscultation and *percussion* prove the same; the sounds being heard at the right side of the sternum, perfectly normal, and the *percussion* gives dull sounds on the right breast, while the left is clear.

MALPOSITION FROM DISEASE.

330. Pleurisy, pneumothorax, organic diseases of the lung or abdomen, may thrust the heart wholly out of its usual position; either far up towards the clavicle, as in distension of the abdomen, or to the right side, as in case of pleurisy of the left side. So, too,

pleurisy, &c., of the right side, may push the organ to the left beyond the nipple. Pneumothorax and diaphragmatic hernia will do the same (167, 140).

331. *Inspection*, *palpation*, and *percussion* will easily indicate this change.

332. *Auscultation* will likewise share this change of position ; but it may mislead you in reference to the actual condition of the heart ; for the obstruction caused to the heart by thus being thrust out of place, produces, at times, a bellows murmur which may, by its rasping character, simulate severe valvular disease. Be careful of inferring anything from these sounds when there is any great change from the normal position of the heart (314).

SIGNS OF POLYPI OF THE HEART.

THAT we can sometimes *suspect* the existence of polypi or coagula in the heart, I am not disposed absolutely to deny ; but the cases in which we can make this diagnosis, generally occur when patients are *in articulo mortis*, or so near death that we can do nothing for their relief. The symptoms are an obscurity of the sounds of the heart, and a bellows murmur ; and usually some irregularity of motion (223, 219).

DISEASES OF THE ARTERIES.

ROUGHNESS OF THE ARCH OF AORTA.

ROUGHNESS, simply, without other serious lesion of the aorta, I do not consider an affection worth much notice. In connexion with various diseases of the heart it becomes of some importance, from its producing according to some writers a roughened, quite superficial bellows murmur, just at the upper part of the sternum (223). This sound, it is difficult to distinguish from an obstruction-sound of the aortic valves (297). It is but just, however, to say that one able writer (Dr. Graves) has given the report of a case in which there was great roughness of the aorta, but no morbid sound was heard along the aorta; on the contrary, a loud sound appeared over the ventricle (227).

SIGNS OF ANEURISM OF ARCH OF AORTA.

BEFORE the arch is so dilated as to cause some absorption of the upper part of the sternum and some prominence thereof, simple *inspection* teaches nothing. When a tumor appears, it is superficial perhaps, though distinctly seen to be pulsating by the eye of the observer. It may gradually project three or four inches from the level of the sternum (*fig. 38, 344*), and in this case the pulsations become still more evident (249).

336. *Palpation*. Not unfrequently we can feel an impulse and likewise a purring thrill before the tumor is very manifest to the eyesight. Simple impulse, however, is not a proof of aneurism, because there may be a tumor pressing on the aorta, which last may be normal (250, 251).

337. *Mensuration* is of little importance, for inspection is much better, and supersedes it. It may sometimes be needed (252, 344).

338. *Auscultation*. You may sometimes hear no sound or have no sign from auscultation.

For example. A very small aneurism of the arch,

which does not compress any important part, may remain latent to auscultation.

339. But suppose it is larger, or of the same size, but so situated as to compress one of the primary bronchi. In this case you may, with obscure rational signs of disease of the circulatory organs, find decided diminution of vesicular murmur throughout the whole of one lung. One primary air-tube may be compressed, and will then allow, perhaps, only half its usual quantity of air to enter. In this case, likewise, you may hear some bellows murmur (28, 223).

340. As the disease augments, a simple, clear sound, or, more commonly, a bellows murmur, sometimes very distinct, like a saw-mill sound, may be heard towards the upper part of the sternum, or behind, along the vertebræ, on a level with the spine of the scapula (253). This may become very rough in its character. Formerly, this buzz was considered *pathognomonic* of the swift rushing of blood through an aneurism. It merely suggests an aneurism, but can never prove it.

341. Still further; if the disease form a tumor so large as to compress and push aside a portion of the lung, there will be an entire absence of the respiratory murmur to some extent on both sides of the median line of the sternum (28, 41). This phenomenon, however, does not generally occur unless other signs, such as prominence of the part (204), the purring thrill, &c., accompany it (206). Of itself, it would not be pathognomonic of aneurism, for

though it should certainly lead us to suspect aneurism of the arch of the aorta, still it might be produced by any tumor lying directly over the aorta (348 a). At times there is very strong bronchial respiration.

342. Finally, when the disease projects as in the profile plate given below (*fig. 38, 344*), if the tumor has the thrilling feel (206, 251); if it pulsates (251); and is flat on percussion (101); if the circulation is troubled; especially, if, combined with these, we find the pulse in one wrist less than in the other, we may feel very certain that there is aortic aneurism (348 a).

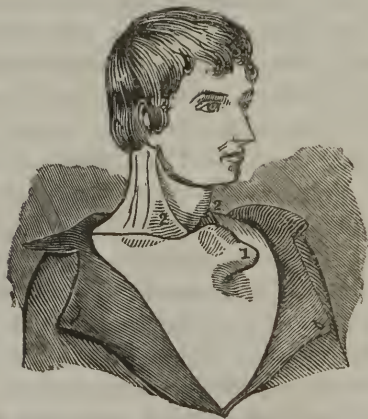
343. *Percussion.* Of course this indicates nothing until the tumor is of some size, and it is then merely corroborative of other signs. When the tumor augments so as to compress the parts underneath, even if it does not wholly reach the sternum, you may get a *change of pitch or note* over the part (99). When it is very large, especially if it cause any prominence, you will find complete dullness (101). The diagnosis between this and a malignant or other tumor over the arch may possibly be gained by auscultatory percussion (390), but I have no experience in that matter.

344. *EXAMPLE OF ANEURISM OF THE AORTA.* A. M., porter in a large wholesale warehouse, aged 44, entered the Boston Infirmary for Diseases of the Lungs, Nov. 20, 1839. He had been a patient of Dr. Perry's. The account he gave of himself was as follows: Health, in early life, good; seven years before consulting us he had had dyspnœa and cough

without expectoration, and with these symptoms he had occasionally suffered from that period. At his entrance, there were soreness in the cardiac region, and pain shooting to the left shoulder and left arm; hoarseness; constant dyspnœa, and an increased cough, with some expectoration. The other functions were healthy. On examination by *inspection*, a tumor (249) was seen, bounded above by the clavicle and the upper part of the sternum; at the left, by a line let fall from the clavicle an inch from the sternum; below, by the cartilages of the third rib; and at the right, by a line drawn from the middle of the sternum. The tumor was circular, and raised one quarter of an inch above the surrounding parts. On *percussion*, the sound was normal everywhere on the chest except over the tumor, where it was flat (101). On *palpation*, a purring sensation was perceived over the tumor (251). On *auscultation*, the respiration was normal everywhere, except that it was more distinct on the right back than on the left (339), and that over the tumor it was bronchial or nearly tracheal (41). The sounds of the heart were heard slightly over the cardiac region (215), but on ascending the tumor they became much more manifest, especially the second. No bellows murmur (223, 253). Some sonorous râles were heard on the back (62). The tumor continued to augment till the patient died. The investing skin became very thin, so that for months it seemed as if it would break. In November, 1841, it projected, as repre-


sented in the plate (*fig. 38*) *beyond* the line of the chin. It made so formidable a tumor, interfered with his labor so much, and was so liable to be injured, that, for a time, he wore a metallic shield over it. It was nine and a half inches in circumference, and projected about one inch and a half above the level of the sternum. The sterno-mastoid muscles were raised upon it, and all the muscles of the neck were very much developed. The accompanying plate represents his appearance at that time. 1 is the tip of the tumor, very thin and somewhat discolored, dark. 2 2, are the sterno-mastoid muscles raised upon the tumor.

Fig. 38.



The last time he visited the Infirmary (June 22, 1842), its apex was three inches beyond the level of the sternum, and had a purplish aspect, and the pulsation could be seen at a great distance from him. In August, 1842, he went to the close-stool and the aneurism burst. Having always been of a most cool temperament, he firmly thrust his handkerchief into the aperture, where it remained until he died, three days afterwards. At the autopsy, an immense aneurism of the arch of the aorta was found pressing forward and causing absorption of the sternum, and likewise backwards, producing absorption of the bodies of several of the dorsal vertebræ.

ANEURISM OF OTHER PARTS OF AORTA.

IGNS like those mentioned in the preceding section, may be present in aneurisms of the *thoracic aorta*. The physical signs, however, would be more manifest at the posterior part of the chest than they would be in front. These are, a diminution of the respiration on one side of the vertebræ (339), and prominence of the ribs at their junction with the same (335), the aneurismal buzz (340), and dullness on percussion (343).

346. In *abdominal aneurism* there may be prominence, &c., in the loins. This, combined with rational symptoms, may lead us to a diagnosis, but we must be very careful in ausculting in front, through the parietes of the abdomen, not to lay much stress upon any amount of bellows murmur that may be heard, for the pressure of the stethoscope on the aorta is apt to produce it. For the signs, see those of aortic aneurism (335 to 343).

ANEURISM OF THE SUBCLAVIAN.

347. For the signs you may have the tumor, the pulsation (251), the purring thrill (251), and the bel-

lows murmur (223), as in aortic aneurism (335 to 343), but the prominence is less, and situated about the clavicle.

ANEURISM OF OTHER ARTERIES OF THE BODY.

348. For signs, see aneurism of the arch of the aorta (335 to 343). The tumor will, of course, be in the part corresponding to the diseased artery. In the extremities, palpation will be of more service than anything else. But this comes under the province of surgery rather than of medicine.

TUMORS OVER ARTERIES, SIMULATING ANEURISMS.


348 *a*. You may at times be in doubt upon this subject, for you may feel a pulsating tumor (251), hear a bellows murmur (223), and find flatness on percussion, &c. (101), as in aneurism. Ordinarily the diagnosis will not be difficult, if we compare the rational signs with the physical, and these latter with each other. The pulse will assist very much in aortic aneurisms; as aneurism of this tube frequently interferes with the arteria innominata or the left subclavian, and, consequently, with one or both of the radials, &c., according as it encroaches upon the current of blood sent towards the origin of the former vessels, and checks.

348 *b*. For instance, aneurism of the aorta frequently causes a difference in the pulse in the two radials or carotids. It might have a similar effect

on the femoral arteries. A tumor would be less likely to produce this effect. Aneurisms along the course of the carotids, brachial or femoral, will also present difficulties. A tumor of the thyroid gland will, at times, protrude to one side, and will appear to pulsate, giving the appearance of disease of the carotid underneath. By making the patient swallow, we see these tumors rise and fall with each act of deglutition, showing it to be evidently a disease attached to the trachea, and not an aneurism of the carotids. In like manner, pulsating tumors will be found in the legs. We can frequently, by deep pressure, separate the tumor from its bed, raise it a little from the subjacent artery, and thus relieve the pulsation. Notwithstanding all these remarks, the diagnosis is at times somewhat difficult, and requires all the *tact* of the most experienced surgeon.

OBSTETRIC AUSCULTATION.

OBSTETRIC AUSCULTATION.

 IN the course of my midwifery practice I have frequently ausculted women when in labor, and have heard all the sounds that will be hereafter mentioned. I have made use of them to satisfy myself of the death or life, and the position of the fœtus. But I have rarely ausculted in the earlier months of pregnancy. So that most of the remarks that I shall make in regard to *these periods* I shall quote from others.*

350. You may use your ear or a stethoscope, according as you may be accustomed to use one or the other in examinations of the chest. You may hear better with your ear, but you would do well to auscult at times with the stethoscope, as in some

* Cyclopædia of Practical Medicine, "Signs of Pregnancy," by W. F. Montgomery, M.D ; Observations on Obstetric Auscultation, by Ivory Kennedy, New York, 1843 ; Andral's Edition of Laennec, Paris, 1837. In preparing this second edition, Dr. C. G. Putnam, whose experience in obstetric auscultation is much greater than my own, has kindly rendered much assistance to me by revising this chapter.

cases you may need it. You must have the room very quiet, more so than in pectoral examinations. You will press your ear on the abdomen firmly, but not in such a manner as to disturb your own powers of hearing. Let the patient be lying on her back in bed, and with a single covering; not that this position is absolutely necessary, but it is the best one (19. 1).

351. There are three auscultatory phenomena which are of service in the practice of midwifery, viz. the uterine soufflet or placental murmur, as it is usually called, the sounds of the fœtal heart, and the soufflet which is occasionally heard in the funis.

UTERINE SOUFFLET OR PLACENTAL MURMUR.



s early as the fourth month, or perhaps earlier (see below), that is, before quickening, and when the uterus is just rising out of the pelvis, you may perceive, if you have a sharp sense of hearing, a sound resembling the bellows murmur of Laennec. Now this varies, as in the chest, from the slightest breezy murmur up to the most violent sawing sound (223). At times, like that of the chest, it becomes softly cooing, droning, or musical (224).

353. It is *not constant*; that is, either from change of posture of the womb, or from its contraction, as during labor, and perhaps from other causes, it sometimes ceases to be heard.

354. But when heard, it is always in the *same place*, unless indeed during the intervals between the two examinations the womb has enlarged. N. B. Some have denied that this proposition is so universally true as I have stated. It is certain that exceptions to it are very rare.

355. Some say that this sound is owing to the passage of blood in the uterine vessels connected with the placenta, and of course ceases when these vessels have ceased to be pervious.

356. During a labor pain it is either much diminished in intensity, or it ceases wholly; and usually it entirely disappears the moment the placenta is thrown off. It may, however, continue a very short time afterwards, owing apparently to the vessels of the uterine placenta being still pervious, and the womb uncontracted. It may continue a little while after the death of the fœtus. Dr. Putnam tells me that he has at times heard it for twenty-four hours after delivery, which fact proves that the placental vessels are not the only ones that can cause this sound. It alternates and corresponds with the mother's pulse. It is heard most distinctly over the spot corresponding to the attachment of the placenta, which is most frequently on the right side;* but at times it is perceptible even as low as the inguinal region. .

357. Some doubt appears to exist as to the *earliest period at which this sound can be heard*. Drs. Kennedy and Irvine record cases in which as early as the tenth week after conception, they *suspected* pregnancy (and would not declare the patients to be in the contrary condition, which, under the circumstances, was a very desirable object), simply from *repeatedly* hearing, on two or three successive days, a *souffle* just over the pubes. Dr. Montgomery has never heard it until the fourth month has been completed, although he has frequently endeavored to hear it earlier. Dr. Kennedy discovers it before any uterine tumor can be observed.

* Dr. Montgomery, Cyclopædia of Practical Medicine.

SOUNDS OF THE FŒTAL HEART.

DURING labor, the sounds of the fœtal heart can usually be heard without difficulty. Dr. Putnam suggested to me that these sounds may be very perfectly imitated by the following simple experiment.

Let a thick leathern-bound book be covered with several folds of a napkin or a handkerchief. Place it, thus arranged, upon your ear, and tap *very gently* upon the napkin (so as not to cause any distinct motion of the book against the side of the head), and the indistinct, muffled sound will represent one fœtal pulsation. By striking uniformly and always very lightly at a rate of about one hundred and thirty-six times a minute, you will obtain a very exact idea of the sounds of the fœtal heart, when heard through the parietes of the abdomen and of the uterus of the mother.

359. This frequency usually distinguishes the fœtal heart from the mother's circulation. Yet it may be very much altered, quickened, or weakened, &c., by the various conditions of the parent. Mental emotions, joy or sorrow, hæmorrhage, labor pains, &c., produce changes, though no general rule can be

laid down in regard to the amount or character of these changes. But they may become of vital importance to the child under certain circumstances, and it is well for you to study the pulsations in every case with reference to this point. The following case shows the excellent results of a wise auscultation.

360. EXAMPLE. A physician in a neighboring city was in attendance on a woman in labor. He had heard the fœtal heart several times, and it seemed perfectly normal. Suddenly, the patient began to appear somewhat languid, and showed other, though indistinct signs of depression of strength, and on auscultation he found that the heart of the fœtus had ceased to beat. He inferred that there was internal hæmorrhage, and that the child was dying or dead in consequence thereof. He immediately turned and delivered by the feet. The child was still-born; the placenta was found detached, and internal hæmorrhage, as he anticipated, had taken place. By the use of artificial respiration the child was restored. In this case, the fœtus would probably have died, if the physician had not been acquainted with obstetric auscultation.

361. Sometimes the sounds have a metallic character like the *metallic tinkling* in pneumothorax. From its being always heard in the right iliac region, Dr. Kennedy suggests, with truth, as I believe, that it is owing to the transmission of the sound

through a distended cavity with thin walls like the cœcum (66).

362. The *extent* over which you will hear the fœtal sounds varies much. You can always decide, however, on the spot whence it radiates. It, of course, is heard low down on the abdomen, at the earliest period at which the sound can be heard, viz. about the fourth month, or somewhat later. Immediately over Poupart's ligament, on either side, you will perceive it in its greatest distinctness. As the uterus augments, it will be heard a little higher, but it is rarely, if ever, heard with *most distinctness* above the line of the umbilicus. In breech presentations the sounds are higher up than in presentations of the head.

363. The *earliest time* at which the fœtal heart is heard is somewhat doubtful. Dr. Fisher of this city has heard it about the fourth month, or a little later. Dr. Kennedy, likewise, has heard it at the sixteenth week,* but four and a half or five months, or after quickening, has commonly been the earliest period (352). When ausculting thus early we need a delicate ear and much perseverance. After the fifth month it continues to become more and more evident.

364. Is *absence of the sounds of the fœtal heart* a proof of no pregnancy? No; because the child may be dead, or the position may be altered for a time.

365. Among the *obstacles to obstetric auscultation*

* Obstetric Auscultation, page 61.

may be mentioned borborygmi, which are sometimes so loud and constant that they confuse young auscultators. A nervous female may have such spasmodic movements of the abdominal parietes as to interfere sadly with the operation. Tumors lying on the aorta or its branches, may cause a bellows murmur that by simulating the placental souffle will confuse us. A change of posture may relieve the pressure and remove the sound (3686). It is said that the respiratory murmur of the mother, especially if attended with sonorous râles (62), sometimes obscures delicate fœtal sounds. In these cases we should make the patient cease breathing for a time. The auscultator's head may deceive him if not carefully placed, by allowing the pulsations from his own temporal arteries to be transmitted. In cases of hydatids a sound like chirping or gurgling is heard at times, in consequence of the motion of the hydatids upon each other.*

* I am indebted to Mr. Kennedy, *Obstetric Auscultation*, p. 346, for most of the remarks in this section.

FUNIC SOUFFLE.



R. KENNEDY speaks of a souffle of the funis. He says it is generally heard at a point of the uterus quite distinct from the uterine soufflet, and it is weaker and shorter in its duration. It corresponds in frequency with the fœtal heart, and therefore cannot be confounded with the uterine souffle, which coincides with the circulation of the mother. It may sometimes be produced at pleasure, by the pressure of the stethoscope (254) upon the cord, when favorably placed just under the front part of the abdomen. Dr. Putnam observed it in one case, always in the same spot, during the last two months of pregnancy. This souffle may be an important sign if, perchance, the sounds of the fœtal heart cannot be heard; but in the majority of cases you will not perceive it.

USE OF AUSCULTATION IN LABOR.

By auscultation we may possibly have one more means for deciding the position of the fœtus. The fœtal heart, being heard, for instance, low down towards the right of Poupart's ligament, we may suspect that the back of the head presents to the pubes, and if heard towards the back we might suspect it to be an opposite position, with the face to the pubes. If heard high up, we might, on the contrary, suspect a breech presentation. But this is of little importance, because the results are much less definite than in some other cases.

367. Suppose the question is on the application of the forceps or the perforator. If the child is dead we need not fear the perforator; if otherwise, we might not try it. Now, the only *sure* sign of death is a constant absence of the sound of the fœtal heart. Again, a woman sometimes feels certain that the child is dead. She has felt no motion for many hours. The auscultator may assure her of her mistake, if he hears the fœtal heart, and new hope is thereby instilled into the sufferer's breast. Hence it becomes right for every practitioner to auscult his patient se-

veral times during labor, and any one who neglects this fails in the performance of his obvious duty. For an exceedingly interesting case illustrating the use of obstetric auscultation, see above (360). Auscultation may help us to decide when two foetuses are in the uterus. If there is a double pregnancy we, of course, shall hear a foetal heart beating in two distinct, probably opposite, places of the abdomen.

DIAGNOSIS OF PREGNANCY FROM TUMORS, &c.

THE accurate diagnosis of pregnancy by means of auscultation will, I trust, hereafter prevent any practitioner from plunging a trocar into a pregnant woman, on the vain supposition of her being affected with ascites! Tympanitis, too, may make women suspect themselves to be pregnant, and though the stethoscope may destroy the hopes of the patient, still your stern duty as an auscultator will require the destruction of all such fanciful maternal hopes. That such cases do occur the following will prove.*

368 *a*. "Mrs. —, of a full habit, desired me to give her my opinion whether she was pregnant. She has been married for two years, but has had no family. Her abdomen has been gradually increasing in size for the last nine months, and appears now sufficiently distended for a woman at the full period of pregnancy. Her menstrual discharge is irregular, and the breasts much swollen and tense. States, that she quickened some months ago, when she fainted, and shortly afterwards observed the motions of a child, which she has frequently felt since: has even


* Kennedy on Obstetric Auscultation, page 182.

experienced considerable uneasiness, particularly at night, from them. Some weeks since, she had the opinion of a medical gentleman of some eminence, who, on her expressing doubts of her being pregnant, told her, 'Madam, you are just as surely pregnant as that I am not.' Since then, she consulted Dr. Collins, who expressed a very contrary opinion, and gave her to understand, that her swelling and other appearances of pregnancy depended upon *wind*. With these conflicting opinions pressing on her mind, she subsequently called on me to pronounce as to her state; at the same time informing me, that whatever opinion might be expressed, no human being could convince her that there was not something alive and moving within her. On examining the abdomen most attentively, it was impossible to say, from the extreme distension of its walls, whether it did or did not contain an enlarged uterus. The vaginal examination was little more satisfactory, as I could scarcely feel the os uteri with the extremity of the finger, there was such a depth of the parts, and she was so irritable under examination. Recourse was had to auscultation and percussion: by the assistance of the former, naught but a diffused intestinal murmur, with the puffing and borborygmus, could be distinguished; while on percussion, so decidedly a tympanitic sound was emitted, as to leave no room to doubt of the cause of the swelling and other symptoms. The oil and turpentine draught was ordered for her, but she was prohibited by her husband from taking it for some

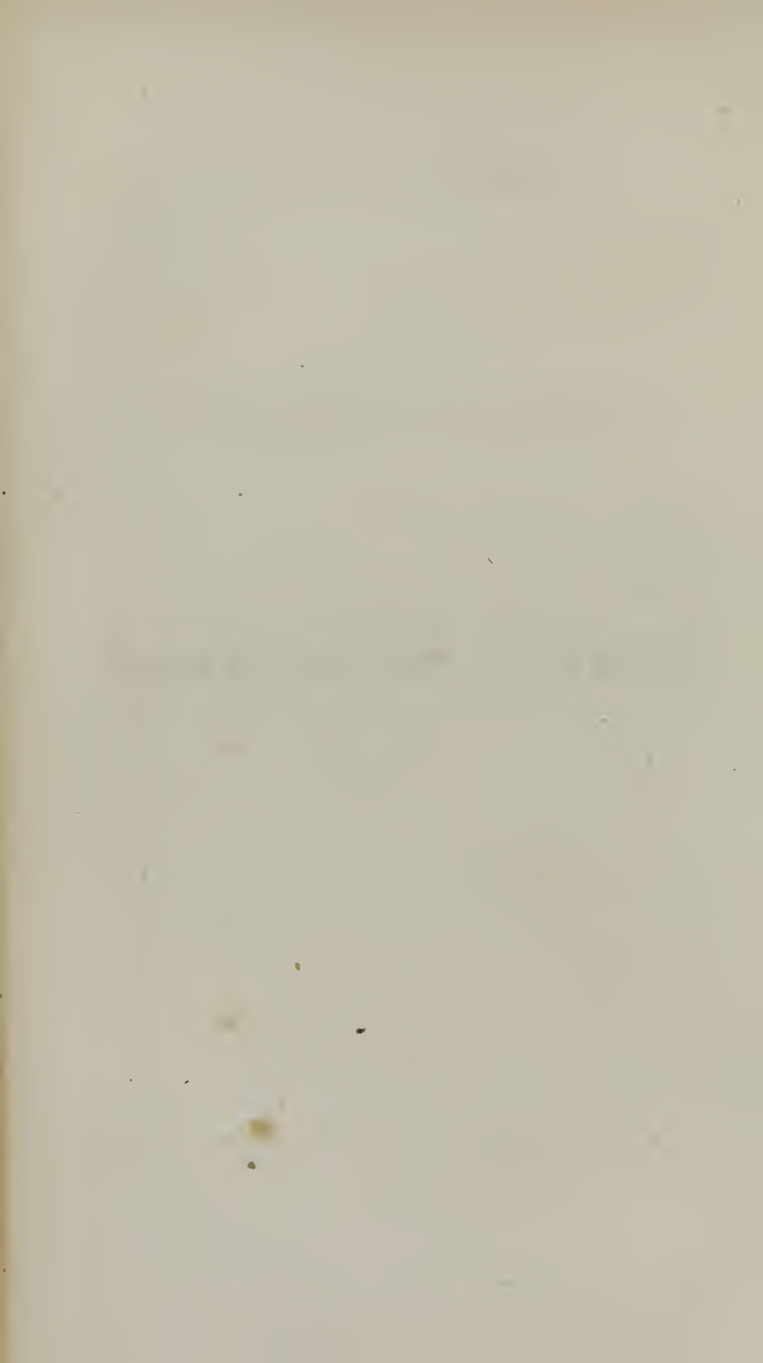
time, lest, as she stated, the child should be injured. However, she did eventually; and the consequence was, that the bowels were freely acted on, flatus and fæces expelled in considerable quantity, and all the symptoms of pregnancy vanished."

368 *b*. Some tumors give rise to a souffle (352). Dr. Putnam has examined many tumors of the abdomen, and although, at times, he has heard a piping sound from the pressure of the tumor upon a large artery, he has always been able to recognise it as very different from the uterine soufflet. Once only in a case of chronic enlargement of the spleen, there was a similar sound, but softer in character. In these cases you must endeavor to decide whether any sounds of the fœtal heart can be heard, for, of course (358), tumors never can produce sounds like those, of the fœtal heart.

AUSCULTATION IN MEDICO-LEGAL QUESTIONS.

INCE the common law does not allow the punishment of death to be inflicted on a woman quick with child, the importance of accurate auscultation to decide whether a woman be pregnant or not, becomes manifest (Appendix A). So, it seems to me, that in our State where a woman is allowed to swear the paternity of a child upon any one, the law ought at least to allow a stethoscopic examination. We are not unfrequently consulted by young women, some wishing to deceive us, and others asking to know the truth about their condition as to pregnancy or not. In these cases auscultation will be of great use, and the skilful auscultator has vastly the advantage of the ignoramus (357, 363).

CEPHALIC AUSCULTATION.



CEPHALIC AUSCULTATION.



IN July, 1832,* Dr. Fisher was examining a case of chronic hydrocephalus, and upon applying his ear over the open and pulsating anterior fontanelle, "he heard a bellows sound accompanying each pulsatory movement of the fontanelle, and synchronous with the pulsations of the heart." This was the origin of cephalic auscultation. Dr. F. continued his researches upon persons of all ages, and gives as his results the following.

371. Mediate or immediate auscultation may be

* This section I have obtained chiefly from the writings of J. D. Fisher, M.D., of Boston, as given in his edition of Laennec, Boston, 1838; from the article published by S. S. Whitney, M.D., of Newton, Mass., in the American Journal of the Medical Sciences, in Oct. 1843: and, finally, from a review of a work on Hydrocephalus, published by Thomas Smith, M.D., in the Medico-Chirurgical Review, Oct. 1845.

I may be allowed to state, that in preparing the second editioa, this article has been revised by my friend Dr. Fisher. It presents the actual state and knowledge of cephalic auscultation.

used ; but the latter is preferable to the former, as the ear can easily be applied to the head. The person ausculted should be in a horizontal posture, and the head should be covered with a napkin, and supported by a pillow. If it be a child, the auscultation should be performed while the patient sleeps.

372. The first sound that will strike you in ausculting a young infant, is the noisy sound of respiration heard in the nasal fossæ, &c. It is called by Dr. F. *the cephalic sound of respiration*. This, of course, is modified by any swelling of the schneiderian membrane, and by tumors, &c.

373. The second sound seems to come from a distance. It is the sound of the heart, and is called the *cephalic sound of the heart*. These are the only sounds heard while the patient is at rest. If the child cries or speaks, the sound is generally sharply transmitted, and it appears to arise directly from the cranium. It is called *the cephalic sound of the voice*. It varies somewhat in different parts of the head in its tones and apparent proximity to the ear.

374. The sound of deglutition is likewise heard as we hear it frequently in auscultation of the chest. Dr. F. calls it *the cephalic sound of deglutition*. It is perceived best while the child is nursing.

All these sounds I have heard many times.

375. They are modified by growth and the density of the cranium and brain. The sounds of the heart especially become harsher and coarser, but

more distant, by age. Dr. Fisher, at the time of his publication, had discovered that the cardiac sound was changed in various diseases into a bellows sound (223), hence called *the cephalic bellows murmur*. At times there is heard a *musical* or *cooing sound*.

376. The sound of the heart, in certain diseases, becomes *impulsive*, also, instead of being *soft*, *near*, and almost under the ear, instead of *distant*. The *impulsiveness* Dr. F. considers the greatest peculiarity. It seems as if the brain were moved *en masse* against the interior of the cranium.

377. Subsequently to Dr. Fisher's publication, came the able paper by Dr. Whitney confirming all Dr. F.'s results, except with regard to the "*impulsive*" sound, which Dr. W. says he had never heard, though one of his own cases seems to prove the reverse.* Dr. W. has, moreover, extended the domain of cephalic auscultation by the addition of two new signs, viz. the *cephalic hægophony*, and the *purring thrill* or *fremissement cataire*. The subject has been somewhat noticed by European writers, but they do not seem to have carried it forward. Dr. Smith appears to have studied it with closer attention than any one else.

377 a. I have given this brief historical account, because the subject is new, and I wish to bring it to your notice, as I am satisfied that it is worthy of your attention. I cannot, it is true, promise very much

* American Journal of Medical Sciences, Oct. 1843, page 310.

of a practical character, but a new field is open for you to study upon, and, moreover, the signs may sometimes afford useful hints relative to the nature of a class of diseases which are now as dark as any with which we have to deal.

378. The following is the present state of the knowledge of the morbid sounds. *First. The Cephalic Bellows sound.* This may occur in *cerebral congestion* from any source. Dentition and hooping-cough, for example, are very apt to cause it. It is heard likewise in *acute cerebral inflammation*; *hydrocephalus*; *tubercular meningitis*; *compression of the brain*; *scirrhus induration with softening*, *abscesses of the brain*, and *serum in its membranes*, *ossification of the arteries*, and the *hydrencephaloid disease*. It is evident that, of itself (223, 225), it can be of little service in the present state of our knowledge, save that its absence, at least, is favorable. When it is present, it may serve to interpret other symptoms, or it may be interpreted by them. It never occurs in children before dentition, unless in actual disease of the brain.

379. *Second. The impulsive sound of the heart.* Dr. Fisher mentions, what he calls an *impulsive sound*, by which he means a sensation as if the whole mass of the brain rose and struck the cranium with each sound from the arteries. He has heard it in six cases of cerebral apoplexy, so that he thinks it may be a constant accompaniment of that disease. It seems to be perceived with difficulty. Dr. F. says

that such is the case. Dr. Smith does not mention it, and Dr. Whitney states that he has never heard it. He contradicts himself, however, for he quotes a case which had it (377). That case was one of carcinoma and not apoplexy.

380. *Third. The cerebral hægophony.* This, like the hægophony in the chest, depends on water either in or about the brain. Dr. Whitney distinctly says he has never heard it when the water was in the ventricles *alone*. Dr. Smith seems to have heard it in some largely distended ventricles. The name indicates the character of the sound (54).

381. *Fourth. The purring thrill* was felt once in a case of aneurism of the basilar artery. There was a continuous sort of *bruit de diable* (257), accompanied by a thrill like the purring thrill (206). The patient himself perceived it.

382. *Fifth. A musical sound* (224) is heard not unfrequently in anæmic and other cases. Cases in which a similar sound would be likely to be heard in the arteries and veins of the body (220), are liable to have this sound in the brain.

382 *a.* From the above statement it will be readily perceived that, although, at present, cephalic auscultation will not enable you to make a very accurate differential diagnosis, it will, however, frequently be of some importance in marking permanent organic disease. It should not therefore be neglected.

AUSCULTATION,

AS APPLIED TO

OTHER DISEASES, FRACTURES, ETC.



AUSCULTATION IN FRACTURES, &c.



THE diseases of the ear may sometimes be advantageously examined by means of auscultation. This should be done by observing accurately the sound produced by forcing the air into the Eustachian tube in health, and comparing them with the variations produced by disease.

384. To fractures. It is surprising that no more use is made of this method in obscure cases of fracture; particularly in those of the hip joint, which sometimes, in aged persons, are very obscure. If the ear is placed over the part while an assistant moves the limb, a certain degree of crepitus must be produced (393).

385. It might be used in diseases of the bladder, or rather to distinguish them from calculi in the bladder. When a stone is contained therein, more sound

is of course produced by the striking of the catheter against it than against the walls of the bladder. I am not aware that it has been attended to by surgeons, and yet it seems to me that it might be of service, at least, occasionally.

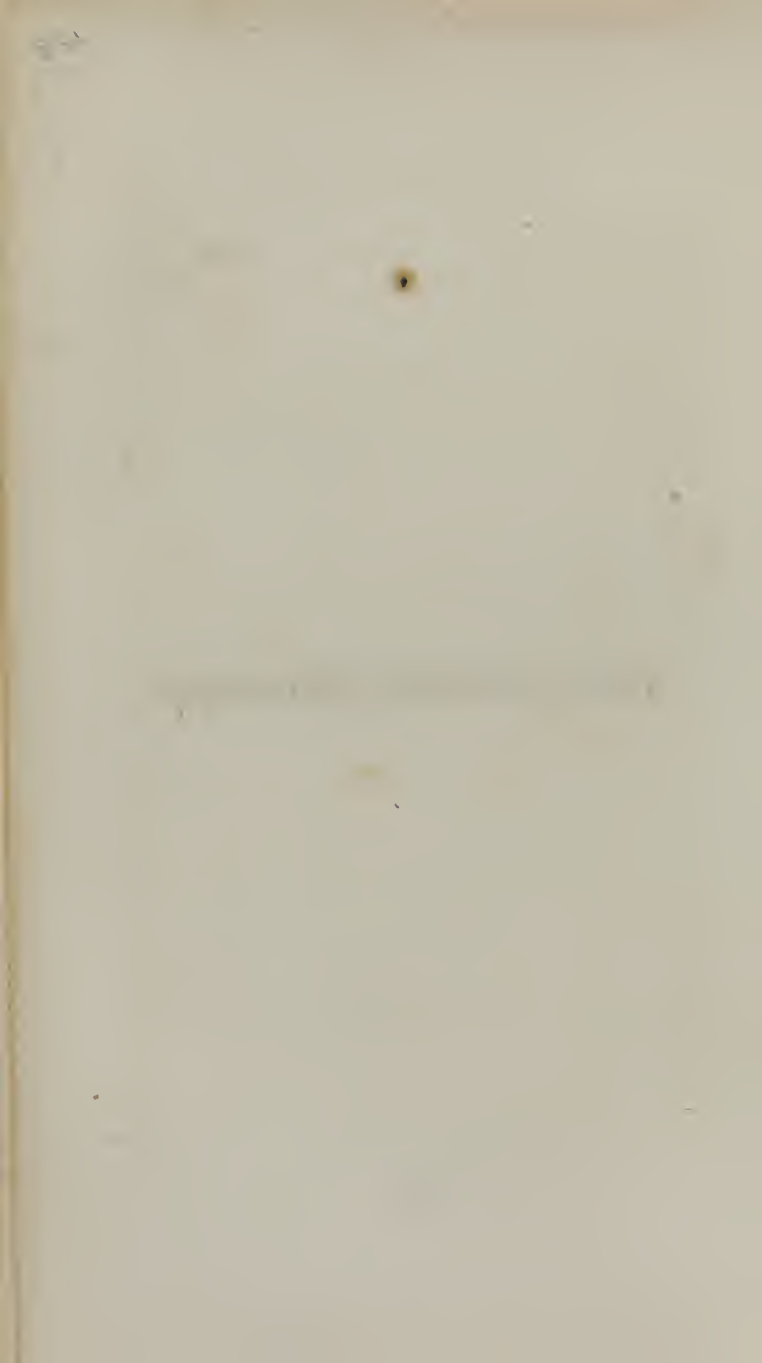
385 *a*. Some have proposed to apply it to diseases of the abdomen. I have no doubt that the auscultation of the abdomen would lead to some curious results, but probably they could never equal those obtained from the thorax.

385 *b*. Since the first edition of this work was published, I have been able to recognise diaphragmatic hernia by means of the physical signs. A young laboring man, æt. 17, entered the Massachusetts General Hospital, September 29, 1846. He was suffering very much from a fracture of the spine, caused by a heavy blow. He had paraplegia, but no very grave thoracic symptoms. Wishing to know how the heart was affected by such a severe injury, I applied my ear over the cardiac region, and was surprised to hear borborygmi exactly similar to those heard in the abdomen. The heart was heard and seen beating to the right of the sternum, while on percussion the left breast was tympanitic and more prominent than the right. Much less movement was observed at the left side of the chest than at the right. The respiratory murmur was wholly absent over the left of the breast, except that on a full inspiration a slight sound was heard immediately under the clavicle. It was puerile over the right breast. No infer-

ence could be made but that the right lung was compressed by a large part of the alimentary canal which had passed through the left side of the diaphragm. I immediately, but too hastily, thought that a rupture of the diaphragm had been produced by the blow upon the neck. I was mistaken, however, in regarding it as a recent injury ; because I did not know and duly consider the bearing of the following facts. The patient had always, from his earliest years, noticed that his heart beat to the right of the sternum ; he had been liable to fits of intense dyspnœa on exertion, and at times to sudden loss of consciousness. These data, together with the negative proof afforded by the absence of all severe pulmonary symptoms, should have led to the belief that the hernia was congenital, or had existed from very early years. At the autopsy almost total absence of the left side of the diaphragm was observed. The colon, stomach, and part of the small intestines were in the chest.

385 *c.* It has been proposed by Perry to apply percussion to the diagnosis of coxalgia and sciatica. Pain is produced when striking on the trochanter in the former disease, while none is perceptible during a similar act of percussion in the latter. I should have doubts about the entire accuracy of the results in such cases.

AUSCULTATORY PERCUSSION.



AUSCULTATORY PERCUSSION.



AUSCULTATORY PERCUSSION is the name given by Drs. Camman and Clark to a new method for investigating the diseases of internal organs. *Practically*, I know but little about it; I shall, therefore, in this section, depend chiefly upon the analysis

of the article published by these gentlemen a few years since.* As the term implies, auscultatory percussion consists in a union of the two methods of examination.

387. In the paper above alluded to, the plan was chiefly applied to the discovery of the *dimensions of the heart*, and as that will afford an example, I shall consider the question chiefly with reference to that organ. The operation is as follows. You will place “the extremity of a cylinder of wood (396), cut in

* New York Journal of Medicine and Surgery, July, 1840.

the direction of its fibres" flat over the centre of the heart, and support it there by your ear resting at the other extremity. Using for a plessimeter either your finger or an instrument adapted to the purpose (*fig.* 26, 88), if you will strike on the walls of the chest, about an inch from the extremity of the stethoscope, you will perceive "a clear, sudden, intense sound of high tone," attended with an almost painful, short, abrupt impulse, appearing to be immediately under the instrument or produced within it. Again, if you put the wood at the end of one of the diameters of the heart, and strike about three inches from it, i. e. at the other extremity of the diameter, you will obtain a similar result, but less energetic in degree. "Strike where the lungs overlies the heart, and you will find that the sound is instantly modified and mixed, but its *cardiac* type is preserved. Strike at still greater distances, moving by short steps towards the body of the lung, and at a certain point the sound will suddenly change, losing its intensity and high tone, and being no longer impulsive, but grave and distant. It will likewise be heard much more distinctly by the open ear than by that applied to the instrument."

388. Explore, in like manner, the hepatic region, "and within short distances you will find that the sound will be clear, intense, and immediately under the instrument as before ; but less intense, less acute, and more prolonged: it will even be semi-reverberant." As the distance augments, the sound will

diminish more rapidly than over the heart, though it will not be entirely lost until you get beyond the region of the liver and upon another medium.

389. The inventors of the system think, by this method, they shall be able to fix the boundaries of the heart and of all the other organs much more distinctly than by methods heretofore employed. In reference to the heart I think the common methods are sufficient where itself alone is diseased. But in cases in which there is disease of the adjacent parts, either of the chest or abdomen, and the dullness, resulting from the ordinary methods of percussion in such disease, is immediately continuous with that produced by the heart, this method may, I think, become a means of diagnosis, when we might find a difficulty with our other methods.

390. But in addition to this, it is *hoped* that by it we shall be able "to distinguish with facility serous effusion into the pericardium from any form of disease of the heart itself." May it not likewise help us to decide in cases of doubt as to the nature of a tumor: for example, between aneurism and a steatomatous or malignant tumor?

391. It is capable of being applied to the spleen and kidneys, upon both of which organs the common methods of physical diagnosis are wanting in accuracy. It seems to me that it may be of especial value in the recognition of organic enlargement of the kidneys.

392. In examining *the liver* Drs. Camman and Clark

say, that they can follow it nearly an inch higher on the chest than by ordinary percussion ; they can trace its left lobe and its lower border to the extreme limits of its thin edge. They are able to limit the upper surface of the liver, when adjacent to a hepatized lung, or to an effusion into the right pleura. They limit the lower, thin edge of the organ while immersed in the serous effusion of ascites, and, finally, they can mark the line between the liver and spleen when both are enlarged and in contact.

393. It is hoped, likewise, that by auscultatory percussion we may be able to decide between *true and false anchylosis*. One case only had come under the notice of the inventors of the method at the time (1840) they wrote on the subject. In that case, there was supposed to be a perfect bony union at the hip-joint, and the sound of percussion was transmitted, from the condyle of the former to the pelvis, more distinctly by the diseased than by the healthy limb.

393 *a*. In *fractures of the bones*, if the ends are in contact, the sound and impulse are transmitted ; but if they are separated, both impulse and sound are chiefly lost. In the majority of instances, however, this method of distinguishing fractures cannot be relied upon.

TYPE SOUNDS.

THE following statement will afford an idea of the relative powers of different textures in the conveyance of sound by auscultatory percussion.

“We find, for example, that among the tissues of the body, bone is the best conductor of sound ; that cartilage is but little inferior to bone in this respect ; that muscle when tense is a good conductor,—relaxed, it hardly conducts at all ; that fatty tissue uncondensed conducts badly ; that œdematous cellular tissue has a minimum conducting power ; that any tissue or group of tissues under tension conducts better than when relaxed ; that the spinal column is a bad conductor ; that both sound and impulse are transmitted from one bone to another, through interposed soft tissues, if such tissues be condensed by moderate pressure ; that articulations in a healthy state conduct both sound and impulse, but with loss of energy ; that sound and impulse are not entirely lost in passing through two successive articulations ; that fractures and dislocations do not in most cases wholly interrupt the conduction of sound ; and that the sound is more intense than natural in passing through certain diseased joints.

“Some of these latter propositions deserve particular consideration. That bone should be both sonorous and conductive, might be inferred from its structure; but that sound should make its way through an articulation where it has to pass, first, from bone to cartilage, then from one cartilage to another, and lastly, from cartilage again to bone; and even where the transitions are still more numerous, as in the joints which possess “moving cartilages,” would have been anticipated only by a reference to two facts: first, the fundamental note of cartilage differs little from that of bone (of this one may satisfy himself by examining the bony and cartilaginous portions of the same rib), and consequently vibrations produced in one are easily taken up and carried forward by the other: and second, the union between cartilage and bone in the joints is intimate, and between cartilage and cartilage the contact is firm. It is true that in every such transmission something is lost, but the loss is no way proportioned to the number of medial changes.”

395. Our authors therefore propose as *type sounds* those heard over bone, water, the heart, and the liver. The first, *osseous*, is the loudest and most energetic; the second, *aqueous*, presents the least of these qualities, and are at opposite extremities of the scale. It may be remarked that fluid in the *chest* is difficult to distinguish by auscultatory percussion, owing to the sonorousness of the parietes being so great. To obtain the true character of the *aqueous*

type, therefore, it must be sought for in the abdomen, as in dropsy, for example. Between the *osseous* and *aqueous* come, first, the *cardiac*, and second the *hepatic*. The former is acute, clear, less conductible than the osseous; it is quick, immediate, intense, rather painfully impulsive, and gives, especially towards the circumference of the organ, a sort of muffled ring. The *hepatic* is graver, more continuous, less freely conducted by the organ over which it is heard, clear, intense, immediate, impulsive.* With these types, all the varieties of sound and impulse heard over different parts of the body, may be compared.

* The following definition is given of these terms.

Immediate, when apparently applied immediately to the end of the stethoscope.

Abrupt, opposed to *prolonged*, &c., refers to the sudden termination of the sound or impulse.

Distant, opposed to *immediate*, impulsive.

Quick, used in the same sense as when applied to the pulse.

Acute, as opposed to grave in the diatonic scale.

Impulsive, causing a shock to the ear.

STETHOSCOPES FOR AUSCULTATORY PERCUSSION.



Fig. 39.



SOLID stethoscope of two shapes is used in these investigations. They are as follows. *Fig. 39* is a solid cylinder of cedar, shaped in the direction of the woody fibres, six inches in length, and ten or twelve lines in diameter. It is furnished with an ivory ear piece, which will allow nearly the whole cylinder to pass through it. It will likewise serve for the common auscultation, but not so well as a hollow instrument.

397. A modified form of this may be used when examining the chest in order to avoid the sound of the bony parietes. It is made in the form of a truncated wedge (*fig. 40*), leaving the extremity to which the ear is applied as before. The narrow end is two lines wide, and can be easily placed in the intercostal spaces.



398. In case we have not these, the common stethoscope *may* be used (19).

399. Finally, a plessimeter is absolutely necessary.

Fig. 41. The finger will answer all purposes; but another has been suggested (*fig. 41*). It is made of steel, with an ivory handle, and place for the thumb to press upon. The part used in percussion is of steel and oval, containing a small piece of india-rubber (88).



DIFFICULTIES OF AUSCULTATORY PERCUSSION.



DIFFICULTIES, that require some notice, are met with in auscultatory percussion. They apply chiefly to the heart, but are suggestive in the examination of all other organs.

401. *First.* To get the full, characteristic sound of the heart, the stethoscope must be placed on a part of the chest with which the organ comes in contact. A novice in the art may meet with serious inconvenience even from the lung lying over the heart.

402. *Second.* The difference between the heart and the liver may not be easy to perceive. The fundamental sounds of the two organs differ but two notes and a half on the diatonic scale in the structure of their parenchymata, and they have similar degrees of consistency. The sounds are transmitted from one to the other, but they change from acute to grave, and lose a part of the impulse. Practice will overcome this difficulty.

403. *Third.* It is, at times, difficult to define the right side of the heart, owing to the sternum's lying over it. By using the wedge we may generally avoid this.

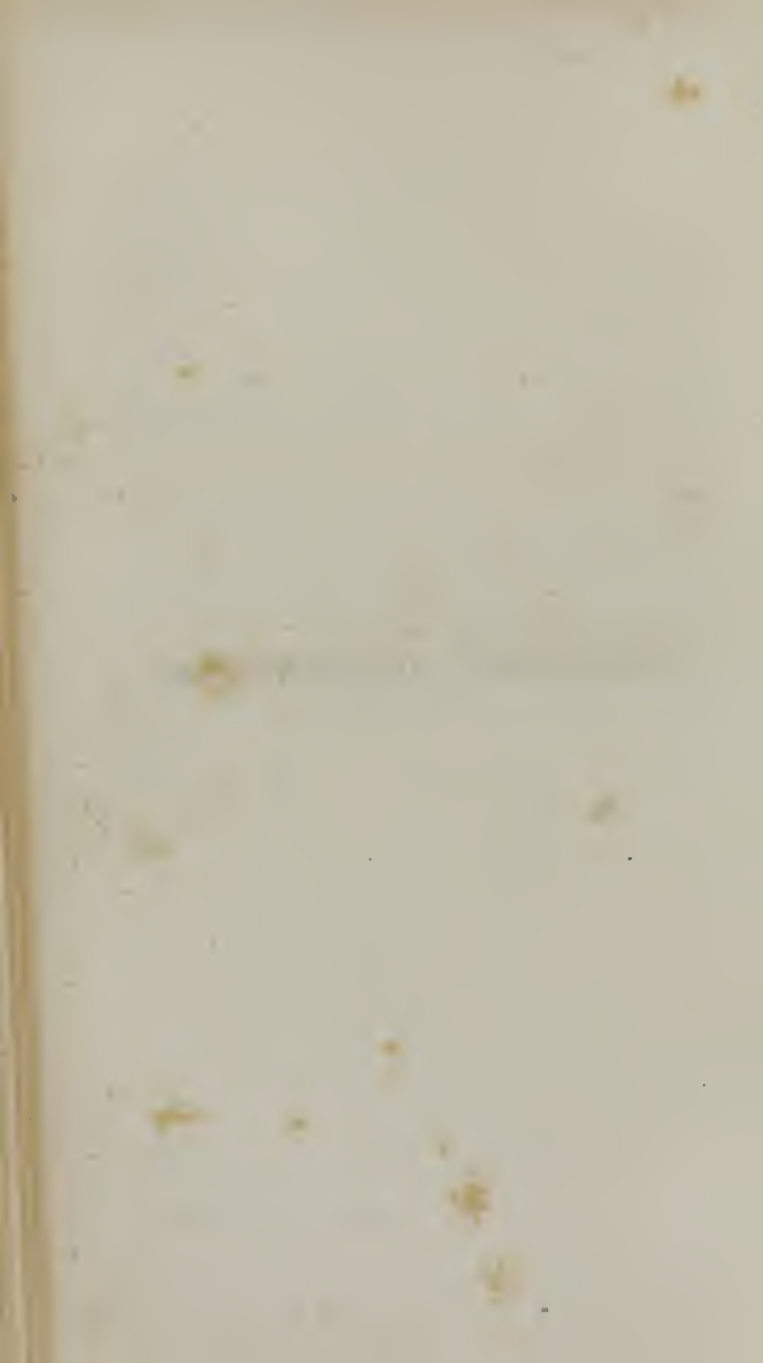
404. *Fourth.* The conducting power of the ribs sometimes embarrasses the exploration of the heart. The wedge assists in this case likewise.

405. *Fifth.* Emphysema may make the chest very sonorous, and cause the lungs to cover the heart. In this case the wedge or a stronger pressure with the cylindrical stethoscope will generally overcome the difficulty.

405 *a.* *Sixth.* The mammæ in females may become a source of error, but we can generally push them aside in common percussion.

406. *Seventh.* Percussion may be too hard, so as to confuse and fatigue the ear of the auscultator. It should be performed with the single finger, and so feebly as to be scarcely audible to a bystander, if at all.

VETERINARY AUSCULTATION.



VETERINARY AUSCULTATION.



VETERINARY AUSCULTATION seems to have been much neglected in England, and is wholly unattended to in this country, a fact which is by no means creditable to us on the score of our knowledge of veteri-

nary medicine or of our humanity.

408. There are certain general ideas which every physician must have who is at all acquainted with auscultation in the human subject. These ideas depend upon his knowledge of the diseases of the thoracic viscera in man, and the sounds produced by these diseases. Similar diseases are found in animals, and, of course, similar auscultatory phenomena must occur. The following remarks on veterinary auscultation are merely *supplementary to what I have given on human auscultation.*

409. I have examined many healthy horses, and have found the respiratory murmur to be usually quite as distinct as in man, and of the same breezy character. The heart also has two sounds. They are very distinct, but they are not so different from each other, as it has seemed to me, as those in the human subject (461).

410. In the following account of the auscultatory phenomena in diseases of animals, especially of the horse, I depend chiefly on what Mr. Youatt* and Mr. Percival† say, premising, however, that they seem to derive much of their confidence in auscultation from the writers of the French school, Delafond, Girard, D'Arboval, &c., whose works I have been unable to procure.

*The Horse, by William Youatt, a new edition, &c., by J. S. Skinner, Philadelphia, 1845.

† Hippopathology, a Systematic Treatise on the Diseases and Lamenesses of the Horse, &c., by William Percival, London, 1840. Also, "The Veterinarian," for April, 1846, a lecture on Auscultation by the same author.

PERCUSSION IN VETERINARY PRACTICE,



R. DELAFOND uses mediate percussion, one of his hands being the plessimeter (83, 84). Some use a wooden plessimeter, and a mallet covered with india-rubber. Delafond says that, for all common purposes, immediate percussion is sufficient; if you remember to strike, first, perpendicularly to the surface sounded; second, to strike the ribs and not the intercostal spaces; third, to use the same force everywhere; fourth, to compare the two sides of the chest (4, 84).

412. The portion of the trunk in which percussion may be advantageously used, may be marked by two lines, one let fall just back of the posterior edge of the scapula, the other in the direction of the last rib. Divide this space by two horizontal lines into three equal parts, which may be called upper, lower, and middle (1, 2, 3, in *fig. 42, 416*). The upper, 1, extends from the scapula to the last rib, along the border of the longissimus dorsi, and includes the superior third of the ribs; the lower, 3, includes the inferior third; the middle, 2, the central third (*Fig. 42, 416*).

413. Percussion affords the loudest sound in the middle region, between the seventh, eighth, and ninth ribs ; from this to the fifteenth it diminishes, when, owing to intestinal distension, it again increases to the last rib. On the right upper region, the sound grows louder from the posterior border of the shoulder to the last rib, whilst on the left it gradually diminishes on the same line. This is explained by the fact that the arch of the colon extends far into the chest.* In the lower region the sound obtained may be compared to that of the upper region behind the shoulder ; and this continues to the ninth rib, whence it lessens until it becomes abdominal. On the right side the sound is a little duller, owing to the liver.

414. For the various modifications of sound, I would refer you to 89, &c., to 101.

* Delafond, in Percival's Hippopathology, page 68.

VETERINARY AUSCULTATION.



IMMEDIATE auscultation is better than mediate (18). Apply your ear accurately, but lightly. The quietness of the night is the best time. Let the animal be amused with a little hay, unless the chewing obscure the sounds. There is the puerile or juvenile respiration as in man (25), and the murmur diminishes in age. It is augmented by exercise. It resembles entirely the sound heard over the human chest.

416. In the following plate the chest is divided by two parallel lines, forming upper, middle, and lower regions, as described (412).

Fig. 42.



417. In the *upper region*, 1, the respiratory murmur is quite distinct.

418. In the *middle region*, 2, it is also very distinct from behind the shoulder; thence increasing a little to the ninth rib, and after that diminishing to the last rib.

419. In the *lower region*, 3, the sound is quite manifest from the elbow to the ninth rib, whence it diminishes to the seventeenth, and there disappears.

It is the same on both sides except in the place of the heart. This is immediately back of the left shoulder and marked 4, and there, of course, the murmur is diminished. It is the best place to hear the heart, although it may be perceived at 5. The middle of the trachea is at 6, and it may be an important place for auscultation (438).

420. We must be careful, so Percival says, not to confound the sound produced by the contractions of the panniculus carnosus muscle with the sounds made within the thorax. I have never found any difficulty, as these sounds are essentially distinct, and occur at different times.

421. Among the peculiarities resulting from the position of the horse, is the existence of a strong supplementary respiration along the spine in cases of pleuritic effusion, owing, first, to the lungs being forced there, and, second, to those portions of them being obliged to do a double share of duty in consequence of the compression of the lower parts.

RÂLES IN VETERINARY AUSCULTATION.

RÂLES are heard in animals as in man ; they have the same general characteristics, and are indicative of the same diseases as in man. For these sounds as heard in man, I refer you to the former part of the work (62, &c). The following peculiarities in veterinary auscultation, as given by veterinary writers, are worthy of notice. In *bronchitis* the mucus, at times, is so adhesive, especially at the lower part of the organ, as to clog up a bronchus (as it does sometimes in man, 112), and to cause absence of respiration, "leading one to believe that there is hepatization of the lung." If you trot the horse under these circumstances the mucus is dislodged. I would add, that percussion would likewise assist in the diagnosis in such a case, as there would be dullness in hepatization (123), whereas there would be no change of sound in simple obstruction of the bronchial tubes. Bronchial respiration (123) also would probably exist in hepatization, but not in the other case.

423. In pleuritic effusion, *bronchial respiration* (41) is heard more frequently than in man. It occurs

usually on a level with the upper edge of the lower division (*fig. 42*), and at the same level on both sides in a horse; but on one side only in dogs and ruminants (owing to the different construction of the mediastinum in the different animals).

424. In *acute pleurisy*, bronchial respiration (134) is likewise said to be heard; but it is very short and quick, owing to the rapid and painful efforts of breathing made by the animal; and being accompanied by "a confused sort of noise," its detection is very difficult.

425. *Pulmonary emphysema* (180), it would seem, is a more frequent cause of *crepitation* (73), than it is in human beings. It is most distinct in expiration.

426. *Pleural sounds* (77). A rumbling is heard when there is air and fluid, or when there are a fluid and false membranes, so as to make many little cells between the layers of the pleura.

DISEASE OF THE NASAL CAVITIES.



TUBULAR sound is heard in the nasal cavities in health ; but a swelling of the schneiderian membrane, or a polypus, will contract their calibres, and produce a whizzing or whistle (62, &c.) Sometimes, these sounds are continued even into the chest, but they are strongest opposite the part affected.

428. *Percussion* may be of use in indicating polypus ; dullness resulting from any solid substance in the cavities.


DISEASE OF THE FRONTAL SINUSES.



y auscultation in health we hear only a very slight murmur in the frontal sinuses. But when the membrane is swollen there may be whistling (62) ; or if the swelling be very great, and thick pus be effused, all sound may be absent.

430. *Percussion*. The resonance is tolerably clear in youth, more so in old age. In disease it may become perfectly flat.

DISEASES OF THE LARYNX.

OUNDS of the slightest character, but necessarily tubular (42) in their nature, are heard over the larynx while it is in a normal condition. In disease the râles heard there may become very important (103).

Le Blanc* mentions the following.

432. First, the dry whistle, from simple contraction of the calibre of the tube, either from natural conformation, compression, or some lesion, physical or vital, of the recurrent nerve.

433. Second, a humid whistle (63), caused by a swollen membrane, covered with mucus. This is sometimes intermingled with the mucous and sonorous râles, as in man (62, 71).

434. Sometimes the mucous becomes a loud gurgling (74), so that it is heard at a distance from the animal. If it is so loud as to make you suspicious that there is disease of the lung, put your ear at the lower part of the neck, and if you find the air passes freely in and out, Mr. Youatt† says you may be sure

* Hippopathology, vol. ii, p. 67, see above.

† The Horse, &c., p. 193, see above.


that there is "no disease of the trachea or lungs,"* but on proceeding up the neck the sound of gurgling will become more manifest, and, finally, over the larynx it will be very loud.

435. *Percussion* gives no results in this disease.

436. *Cough*. The veterinarians say nothing of using the cough as a means of diagnosis ; but I think it might produce a rattle, or augment one already existing, and therefore might be of service.

* I believe Mr. Y. is in error in making this broad assertion. He may say that there is no disease of the trachea, but certainly the fact that the air enters the trachea freely is no proof that the lungs are healthy. The latter part of his direction is excellent, viz. to trace up the course of the wind-pipe.

DISEASE OF THE TRACHEA.

ISTINCT *tubular* (39) sounds are always heard on auscultation along the under part of the neck of the healthy horse i. e. in the course of the trachea (*fig.* 42, 416).

438. The *sibilant*, *sonorous* (62), and *mucous râles* (71) may all be heard in diseases of the trachea; owing simply either to a dry contraction of the tube, or to bands of coagulable lymph, partially obstructing it, &c. In these cases we not unfrequently have the disease called *roaring*. It is so called, because, during the act of inspiration, and when the animal starts suddenly to trot, the air enters with difficulty, and of course, a sound is produced, which sometimes becomes so loud as to be very unpleasant to the rider, making the animal of less value; although it may not really injure his health or powers of locomotion. The far-famed Eclipse is said to have been a "*roarer*."

439. It has been necessary, at times, to perform the operation of tracheotomy for it, and whether for this cause or any other obstruction, you find it neces-

sary to perform this operation, the ear may enable you to decide the spot where the obstruction exists.

440. *Percussion* gives no results.

441. The *cough* may be of service by removing, altering, or demonstrating the position of the obstruction, when by the respiration we cannot decide.

BRONCHITIS IN ANIMALS.

RÂLES varying according to the amount of the disease, are heard in most cases. When the membrane is simply inflamed, with no secretion, there may be simple wheezing, running into the sonorous

(62). The veterinarians do not mention the spot, but judging from analogy (which, by the by, is often an unsafe guide), I should think that the râles would be most distinct towards the sternum, or depending parts of the chest, and would be heard more or less in both lungs. If there is general bronchitis, the râles, I think, should be most conspicuous at these parts, and grow less towards the withers or spine. On the figure (416) they would be most manifest in 3, thence through 2 to 1.

443. *Percussion* teaches nothing.

444. The *cough* may be of service in producing a râle, when it cannot otherwise be heard, or in destroying the rattle that is heard,—in either case showing the disease to be in the bronchi chiefly, and not in the parenchyma of the lungs. (See bronchitis in man, from 105 to 117.)

PNEUMONIA IN ANIMALS.

IT seems singular that neither Mr. Youatt nor Mr. Percival gives any but the most vague directions in regard to *auscultation* in this disease. The crepitous râle (70, 120) is mentioned as occurring, and being as evident and distinct in its characters as the same sound in human beings. Around the inflamed part the respiratory murmur is frequently augmented.*

446. *Bronchial respiration* (41, 123) is likewise observed, but the veterinarians are rather obscure on this subject also.

447. *Percussion*. Mr. Youatt says nothing of this method of examining. Mr. Percival quotes from Mr. Rigot, in which he gives the following very clear account. "*The impermeability of the lung prevents us from hearing the respiratory murmur, by causing a dullness of sound on percussion opposite the diseased parts.*" A sentence which proves that neither Mr Percival nor his authority had very definite views of that upon which they were writing. We however gain one point which analogy and

* Percival's Hippopathology, pp. 74. 81.

physical laws would have told us previously, viz. that hepatization of the lungs in a horse causes dullness on percussion, as in a man (92, 123). Reasoning from analogy, I should think the signs would be most frequently manifested in 3 (*fig.* 42, 416).

448. The *cough* might be used, as I have mentioned above, and I suspect instead of the voice as a test of disease, and might become equally important with *bronchophony*. (See pneumonia in man, 117, &c.)

BROKEN WIND IN ANIMALS.



n veterinary medicine, broken wind is considered by writers as a kind of emphysema (175). Mr. Percival agrees to this remark by Mr. Youatt, but says it may result from injury of the pneumogastric nerve, lesion of the diaphragm, and pulmonary inflammations.

450. *Auscultation.* Respiratory murmur very quiet (178).

451. *Percussion.* Chest more resonant than usual (177).

452. *Inspection.* Chest rounded; intercostal spaces prominent (176).

All these signs may be general or local.

453. In addition to these, Mr. Percival speaks of a rubbing sound occurring in this disease. Laennec observed it in this disease in man. Later writers have doubted it. It undoubtedly occurs, at times, in man. Does it occur more frequently in veterinary practice? I cannot answer the question.

454. Yet further. A sign mentioned by Percival as occurring in local vesicular dilatation, corresponds somewhat with what, according to Laennec, occurs in dilated bronchi, viz. a dry crepitous râle. It is

certainly a very rare phenomenon in human beings, but may be more common in veterinary auscultation. Analogy suggests that we should more frequently find sibilant and sonorous râles in broken-winded animals than in others (180). (See emphysema in man, 175, &c.)

PHTHISIS IN ANIMALS.



UBERCLES are most commonly found at the anterior and superior parts of the lungs (143), near the withers of the animal.

456. *Auscultation* shows a diminished respiratory murmur (149) in the earlier stages, and râles (156) similar to those in man at the later stages of the disease, where cavities, &c., exist.

457. *Percussion* affords its modifications of sound in the same way as in man (146, &c.) I do not know that the *bruit de pot felé* has been ever heard (148), but I see no reason why it should not be heard in brutes as well as in man.

458. The *cough*, though no notice is taken of it by the veterinarians, must be an important aid in recognition of râles. (See phthisis in man, 144, &c.)

PLEURISY IN ANIMALS.



USCULTATION shows a diminished respiration (132), and, at times, a rubbing sound (128), especially at the upper part of the chest, as the early signs of pleurisy, with merely roughness of membranes, and perhaps some slight effusion of lymph. But, within three days, gallons of fluid may be effused, and, of course, the lung will be pushed away from 3 (*fig. 42, 416*), and the respiratory murmur be wholly gone. It is said that, at times, a sound like that of the dashing of water is heard. It seems to me that there must be air as well as water, in order that this sound should be heard (164).*

460. *Percussion* will of course afford but little dullness in the early stages, but when any effusion has taken place, you may find an extensive dullness varying with the amount of the fluid (101, 131). It will commence at the sternum and extend upwards. It will be much more difficult to determine whether one or both pleural cavities are affected in the horse and ox than in the dog; because in the former there seems to be a communication through the mediasti-

* Hippopathology, p. 116.

num, allowing the fluid of one to get into the other. Mr. Percival describes a case in which distinct fluctuation was communicated to the ear, placed on the affected side, while percussion was made on the other (14).* (See pleurisy in man, 128, &c.)

* Mr. Percival speaks of having heard in one case a dull rumbling sound as of fluid in a barrel.

CARDIAC DISEASES IN ANIMALS.



R. PERCIVAL follows Dr. Hope in his description of the sounds of the healthy heart (210). The place for hearing and feeling this organ is just on the ribs, and behind the elbow of the left side, in the small space marked 4 (*fig. 42, 416*). The hand, placed flat against the ribs there, will recognise the pulsations of the heart (240).

462. *Pericarditis*. Mr. Percival gives the symptoms as they occur in man as those which it will be “well for veterinarians to set before them, until, from observations on their part, they are able to confirm or reject them.” Mr. Youatt gives nothing more definite than this, viz. a bounding action of the heart early in the disease, a confused and feeble fluttering movement, when effusion takes place. To the experienced auscultator of man, all this means much less than he knows already. (See *pericarditis* in man, 253, &c.)

463. *Carditis* and *endo-carditis* are evidently not recognised by the veterinarians; though I do not think that they are by any means unrecognisable by one accustomed to human auscultation. (See *carditis* and *endo-carditis* in man, 269, &c.)

464. *Hypertrophy of the heart.* Mr. Percival again takes the common classification of simple concentric and excentric hypertrophy. But nothing new is stated either by him or by Mr. Youatt. (See hypertrophy in man, 275, &c.)


465. *Dilatation of the heart.* (See dilatation in man, 277, &c.)

466. *Disease of the valves.* This is evidently a new subject to the veterinarians. No physical signs are given, yet it is perfectly evident that, as the same physical conditions may exist, so the same physical signs may be heard (283, 289, 294, 297, 302, 307.)

467. *Aneurism.* Of this, Mr. Percival says, "it has never become the object of veterinary practice." Judging from what we know of the results in human pathology, I cannot but think that the veterinarians would do well to make it an object of study forthwith. Such a study would tend to prevent any one from hereafter puncturing an aneurism, as Mr. Percival says was actually done by a veterinary surgeon.* The diagnosis of this disease in horses must be very important, whether it occur in the trunk or extremities, for either would make the animal unsound. When in the former, he would be, of course, incurably so; when in the latter, an operation might relieve entirely. (See aneurism in man, 335.)

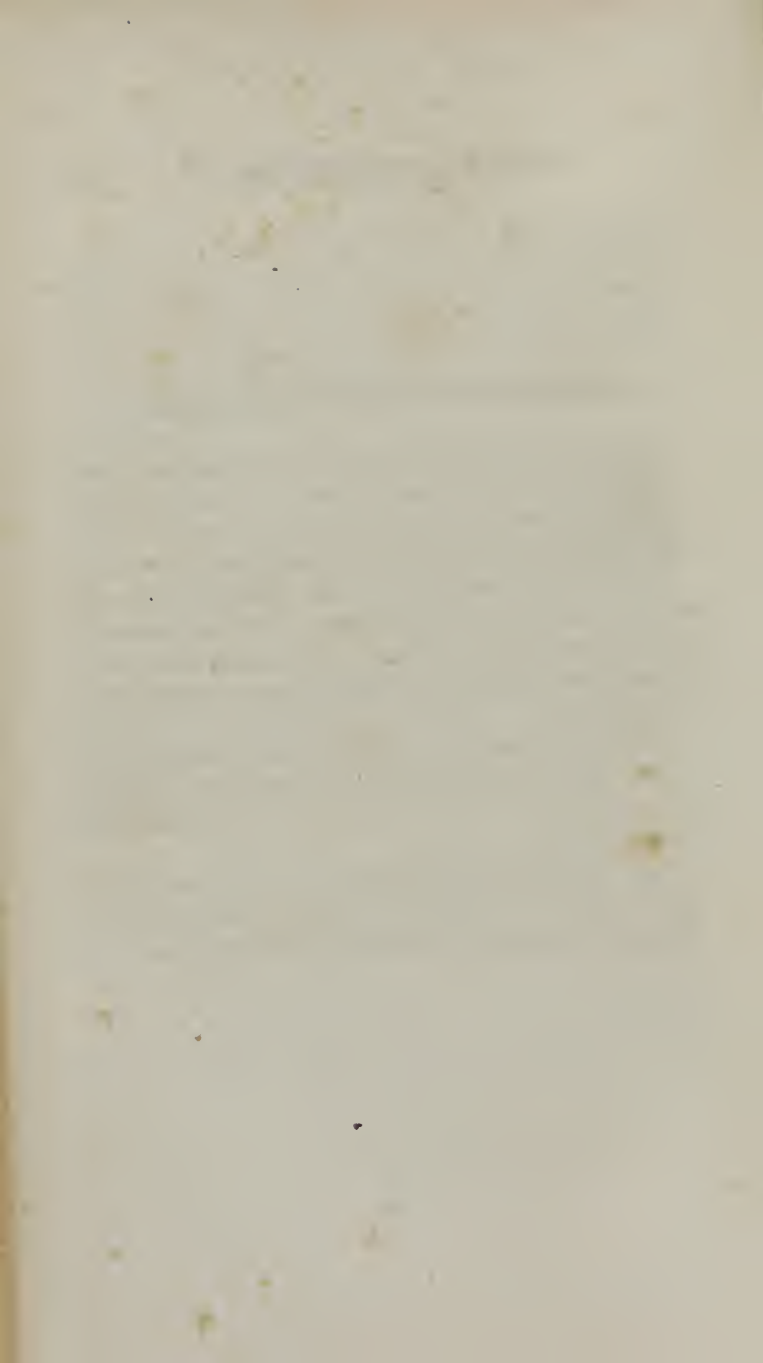
* Hippopathology, p. 70.

VETERINARY UTERINE AUSCULTATION.

OUNDS of the foetal heart may be heard as in the human subject. I have never listened to them, however, and the only very obvious use to which, as it seems to me, auscultation of the uterus in animals can be applied, is to the discovery whether or not a mare is with foal. This is a very important item on many occasions and for many reasons. (See foetal heart, 358.)

370. Percussion also is important, as marking the size of the womb, and may be practised previously to auscultation, in order to accustom the animal to examination.

471. In all these examinations, great caution should be observed to avoid injury from the animal, which frequently becomes restive under this operation.



APPENDIX.

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A, page 217.

## AUSCULTATION IN MEDICO-LEGAL CASES.

473. *First.* Among the most deplorable cases on record, in which innocent human life was deliberately taken, according to legal forms and by the adjudication of the supreme tribunals of the land, that of the child of Mrs. Spooner, who was executed July 2, 1778, stands preëminent. Under our modern means of diagnosis of the earlier periods of pregnancy, especially with our knowledge of obstetric auscultation, such a case, I presume, will never happen [again. It impressed me most deeply, for many reasons; but I quote it now, because it may stimulate you to the study of the minute stethoscopic phenomena of early pregnancy. You may at any time be placed in circumstances in which the knowledge of these may be of the highest importance to you. Mrs. S. was convicted of having been an accomplice in the murder of her husband, and after having been condemned, she begged a *reprieve*, on the ground of being "several months advanced in pregnancy." The execution was stayed one month, and the court ordered a jury of "matrons," or in other words, of ignorant old women, to be summoned, to decide on the question, whether or not she was "quick with child." This practice, a relic of antiquated absurdity, was put in execution, and these twelve *matrons, wise in medical diagnosis!* with two men mid-

wives, decided that she was *not* "quick with child."\* Mrs. Spooner immediately sent to the Council a most touching petition, in which she says, "although the jury of matrons have not decided in my favor, still I am absolutely certain of being in a pregnant state, and *above four months* (363) advanced in it, and the infant I bear was lawfully begotten. I am earnestly desirous of being spared till I am delivered of it. I most humbly desire your honors, notwithstanding my great unworthiness, to take my deplorable case into your compassionate consideration. What I bear, and clearly perceive to be animated, is innocent of the faults of her who bears it, and hath, I beg leave to say, a right to the existence God has begun to give it. Your honors' humane *Christian* principles, I am very certain, must lead you to desire to preserve life, even in this, its miniature state, rather than to destroy it. Suffer me, therefore, with all earnestness, to beseech your honors to grant me such a further length of time, at least, as that there may be the fairest and fullest opportunity to have the matter fully ascertained, and, as in duty bound, shall, during my short continuance, pray." Notwithstanding this urgent appeal of a mother in behalf of her innocent unborn babe, the honorable Council of Massachusetts ordered her execution, and thus inflicted a stain that cannot be erased from the annals of the jurisprudence of the State; and they did so, notwithstanding that two men midwives and one of the "*matrons*" certified that they believed that Mrs. S. was quick with child, and that they had been mistaken in the verdict they had previously given! It was sufficient that "Elizabeth Rice and Molly Tattman" certified to the contrary, and that they believed her to be "not even now (June 27, 1778) quick with child."

With indecent haste, amid the fury of the elements, and the shouts of the crowd, this legal murder was consummated. On the evening of the day of the execution, the "body was examined,

\* American Criminal, by Peleg W. Chandler. Boston: F. H. Carter & Co. Vol. ii., 1845.

as the prisoner had requested, and a perfect male fœtus of the growth of five months was taken from her."

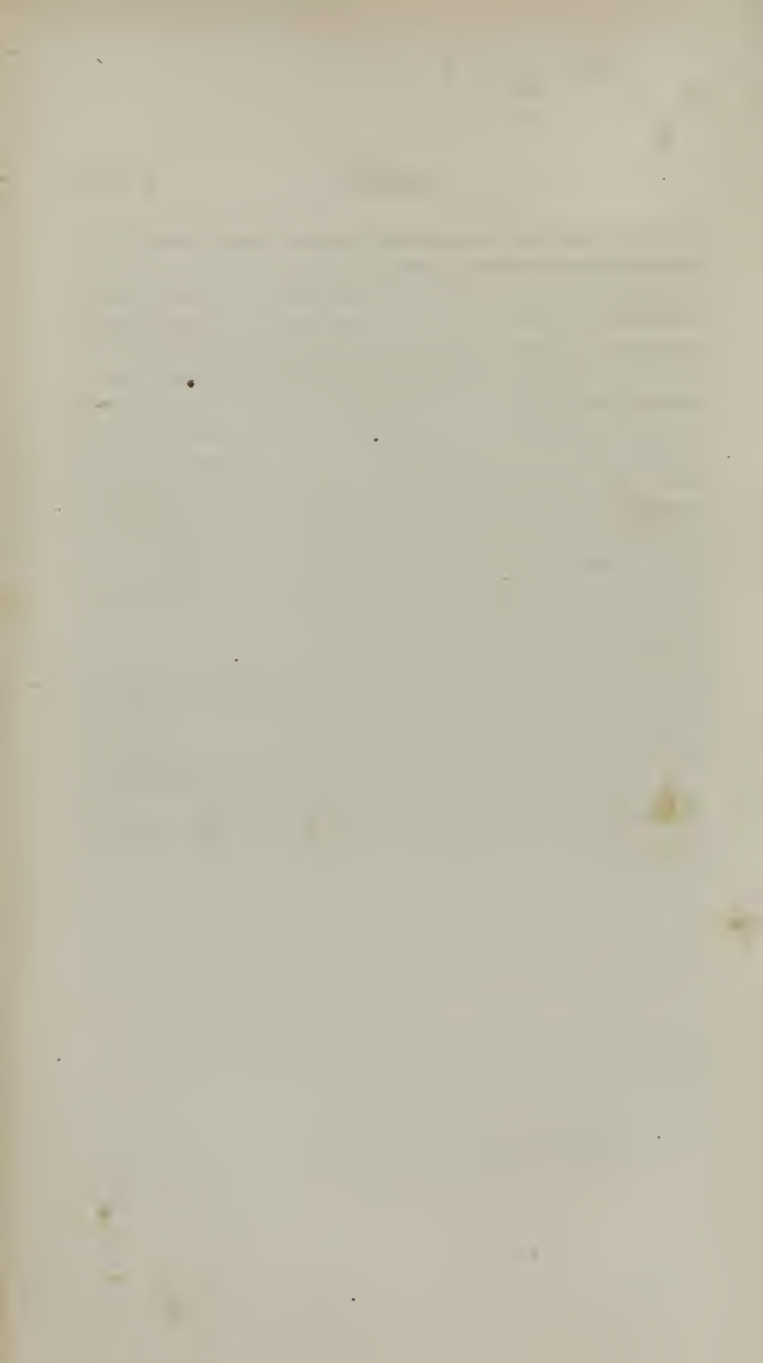
As I have already stated, I quote this case chiefly to show the importance of every sign of early pregnancy in medico-legal questions. I have no hesitation in believing that, had auscultation been known and practised on that occasion, it would have revealed the existence of the sounds of the fœtal heart, and this sad event would have been prevented. Does it not prove to the medical student the importance of accurate obstetric auscultation? For though we have improved somewhat in the forms of jurisprudence during the last seventy years, we are still liable to have the folly of a *matron* jury enacted over again by the advice of the wisest on the bench. The student of medicine ought always to protest against such an absurdity, and to claim for the auscultatory signs their relative and important place among the phenomena of early pregnancy.

474. *Second.* It may be your fate to be called upon, as physician of a prison, to state whether or not a prisoner has such disease of the lungs as to render his longer sojourn in confinement absolutely detrimental to life.

In like manner, the army and navy surgeon is always liable to meet such cases among the soldiery under his charge.

In all such circumstances auscultation may become of great value to you.





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## ERRATA.

OWING to the fact that I was unable to revise the proofs, during the printing of this edition, the following errors have been made, which the reader will please correct :

PAGE

|     |                                              |                                           |
|-----|----------------------------------------------|-------------------------------------------|
| 20  | For “wholly absent <i>by</i> pleurisy,”      | read “ <i>in</i> pleurisy.”               |
| 20  | “ “and <i>by</i> tumors,”                    | “ “and tumors.”                           |
| 22  | “ “air <i>or</i> fluid,”                     | “ “air <i>and</i> fluid.”                 |
| 32  | “ “ <i>from</i> a cavity,”                   | “ “ <i>the existence</i> of a<br>cavity.” |
| 37  | “ “ <i>even</i> in lung cavities,”           | “ “ <i>over</i> cavities in the<br>lung.” |
| 41  | “ “ <i>and</i> when they are the<br>result,” | “ “when they are,” &c’.                   |
| 50  | “ “F. J. Bigelow,”                           | “ “H. J. Bigelow.”                        |
| 62  | “ “ <i>logical</i> signs,”                   | “ “ <i>physical</i> signs.”               |
| 71  | “ “ <i>phenomena</i> ,”                      | “ “ <i>phenomenon</i> .”                  |
| 78  | “ “flatness rises <i>together</i> ,”         | “ “flatness rises <i>higher</i> .”        |
| 80  | “ “ <i>emphysema</i> ,”                      | “ “ <i>empyema</i> .”                     |
| 85  | “ “(figs. 17, 18,)”                          | “ “(figs. 20, 21.)”                       |
| 122 | “ “system by mental emotions,”               | “ “system , by mental,”<br>&c.            |
| 141 | “ “ <i>hæmorrhagic</i> ,”                    | “ “ <i>hæmorrhagic</i> .”                 |
| 199 | “ “and <i>checks</i> ,”                      | “ “and <i>carotids</i> .”                 |
| 221 | “ “Actual state <i>and</i> know-<br>ledge,”  | “ “ <i>of</i> knowledge.”                 |
| 230 | “ “left <i>of</i> the breast,”               | “ “left breast.”                          |
| 231 | “ “blow upon the <i>neck</i> ,”              | “ “upon the <i>back</i> .”                |
| 221 | “ “Perry,”                                   | “ “Piorry.”                               |







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